TO COMPARE THE EFFICACY OF INJ.PHENYLEPHRINE HYDROCHLORIDE WITH INJ. EPHEDRINE HYDROCHLORIDE FOR THE TREATMENT OF SPINAL HYPOTENSION IN INGUINAL HERNIA AND LOWER LIMB ORTHOPEDIC SURGERIES.

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CERTIFICATE

This is to certify that this dissertation titled "**TO COMPARE THE EFFICACY OF INJ.PHENYLEPHRINE HYDROCHLORIDE WITH INJ.EPHEDRINE HYDROCHLORIDE FOR THE TREATMENT OF SPINAL HYPOTENSION IN INGUINAL HERNIA AND LOWER LIMB ORTHOPEDIC SURGERIES**" has been prepared by **DR.M.KALASREE** under my supervision in the Department of Anaesthesiology, Chengalpattu Medical College & Hospital, Chengalpattu during the academic period 2008-2011 and is being submitted to The Tamil Nadu Dr.M.G.R. Medical University, Chennai in partial fulfillment of the university regulation for the award of the Degree of Doctor of Medical (Branch X-MD Anaesthesiology) and her dissertation is a bonafide work.

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DECLARATION

I, **DR. M. KALASREE**, Solemnly declare that the dissertation "**TO COMPARE THE EFFICACY OF INJ. PHEYLEPHRINE HYDROCHLORIDE WITH INJ. EPHEDRINE HYDROCHLORIDE FOR THE TREATMENT OF SPINAL HYPOTENSION IN INGUINAL HERNIA AND LOWER LIMB ORTHOPEDIC SURGERIES"** is a bonafide work done by me in the Department of Anaesthesiology, Chengalpattu Medical College & Hospital, Chengalpattu, after being approved by the Ethical committee, under the able guidance of **Prof. DR.N.KRISHNAN,M.D.,D.A.,** Professor and HOD, Department of Anaesthesiology, Chengalpattu Medical College, Chengalpattu.

Place: Chengalpattu
Date:

(DR. M. KALASREE)

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CONTENTS

AIM OF THE STUDY

To compare the efficacy of **Inj. Phenylephrine hydrochloride** with **Inj. Ephedrine hydrochloride** for the treatment of spinal hypotension.

INTRODUCTION

Spinal anaesthesia is a commonly used regional technique for lower abdominal, perineal, obstetrics, gynaecological and lower limb surgeries. It offers excellent anaesthesia and fewer side effects than general anaesthesia. It is easy to perform and provides faster onset and effective sensory and motor blockade. Hypotension is one of the most common and frequently observed complication encountered in spinal anaesthesia . Recently inj. phenylephrine hydrochloride an $alpha_1$ receptor agonist has been used in the treatment of spinal hypotension in obstetric surgery because it is shown to improve the uterine perfusion and fetal circulation. Since the study has been done in obstetric cases we have decided to evaluate the efficacy of inj. phenylephrine hydrochloride in general surgical cases. This study is designed to evaluate the efficacy of inj. phenylephrine hydrochloride in comparison to inj. Ephedrine hydrochloride in the treatment of spinal hypotension.

SPINAL ANAESTHESIA

Spinal Anaesthesia is a form of central neuraxial block in which a temporary interruption of nerve transmission is achieved following injection of local anesthetic agent in CSF into the subarchnoid space usually below L2 vertebra.

Subarachnoid block is one of the most commonly performed techniques of regional anaesthesia. It provides excellent operating conditions for surgery below the umbilicus.

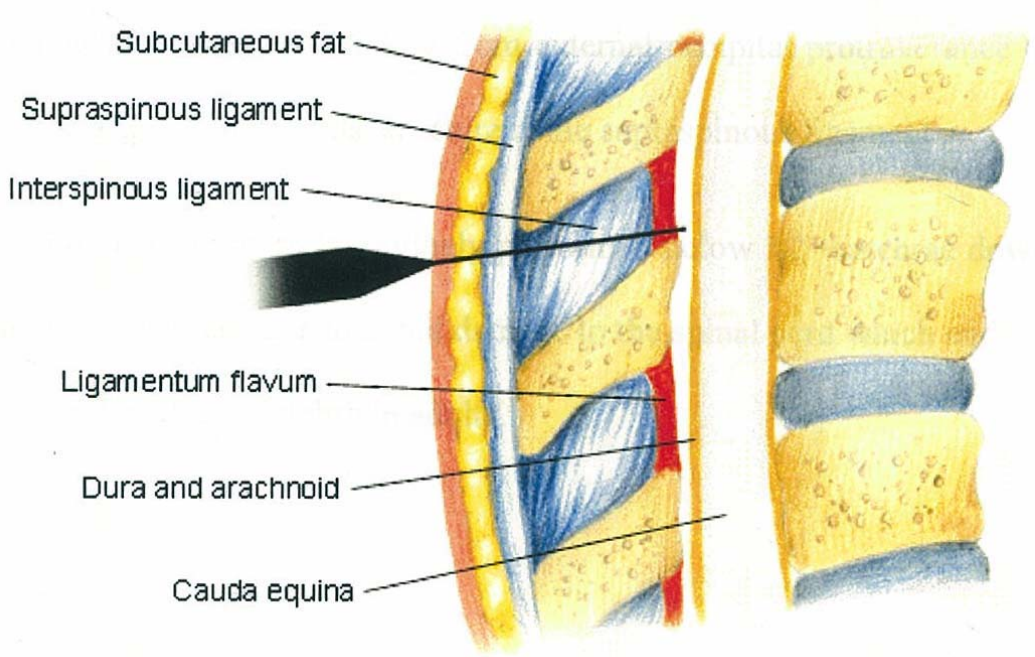
ANATOMY

The vertebral canal extends from foramen magnum to the sacral hiatus. Its boundaries are the dorsal spine, pedicles and lamina of successive vertebrae (7 cervical, 12 thoracic, 5 Lumbar and 5 sacral).The vertebrae are held together by overlapping ligaments namely anterior and posterior longitudinal ligaments, Ligamentum Flavum, interspinous ligament, supraspinous ligament and the inter vertebral discs.

The spinal cord is a direct continuation of medulla oblongata which begins at the upper border of atlas and terminates distally in the conus medullaris.

The distal termination, because of the differential growth rates between the vertebral canal and spinal cord varies from L3 in the infant to lower border of L1 in the adult.

STRUCTURES TO BE PIERCED FOR SUBARACHNOID BLOCK



Surrounding the spinal cord in the bony vertebral column are three membranes (from within to periphery) The piamater, arachnoid mater, and the duramater.

The piamater is a highly vascular membrane that closely invests the spinal cord.

The arachnoid mater is a delicate non vascular membrane closely attached to outer most duramater.

STRUCTURES TO BE PIERCED FOR SUBARACHNOID BLOCK

Subarachnoid space is present between the piamater and the arachnoid mater. In this space, the cerebrospinal fluid (CSF), spinal nerves, blood vessels that supply the spinal cord and dentate ligaments are present. Although the spinal cord ends at lower border of L1 in adults, the subarachoid space continues upto S2.

The outer most membrane in the spinal cord is the longitudinally organized fibroblastic membrane, the duramater. This layer is the direct extension of cranial duramater and extends as spinal duramater from foramen magnum to S2, where filum terminale blends with periosteum of subdural space which contains small amount of serous fluid to allow dura and arachnoid to move over each other.

Surrounding the duramater is the epidural space which extends from foramen magnum to sacral hiatus. Posterior to the epidural space is ligamentum flavum.

Immediately posterior to the ligamentum flavum is interspinous ligament. Extending from the external occipital protuberance to the coccyx, posterior to this structure is the supra spinous ligament, lumbar puncture is routinely performed at interspace from L2 to L5 to avoid damage to the spinal cord which ends at lower border of L1 vertebra in adults.

PHYSIOLOGY OF SUBARACHNOID BLOCK

CEREBROSPINAL FLUID

The cerebrospinal fluid is an ultra filtrate of the blood plasma which is in hydrostatic and osmotic equilibrium. It is a clear, colourless fluid found in the spinal and cranial subarachnoid space and in ventricles of the brain.

The average volume of CSF in adults ranges from 120 to 150ml of which 35ml is in the ventricles, 25ml in the cerebral subarachoid space and 75ml in the spinal subarachoid space. It is secreted by choroid plexes at a rate of 0.3-0.4ml/minute.

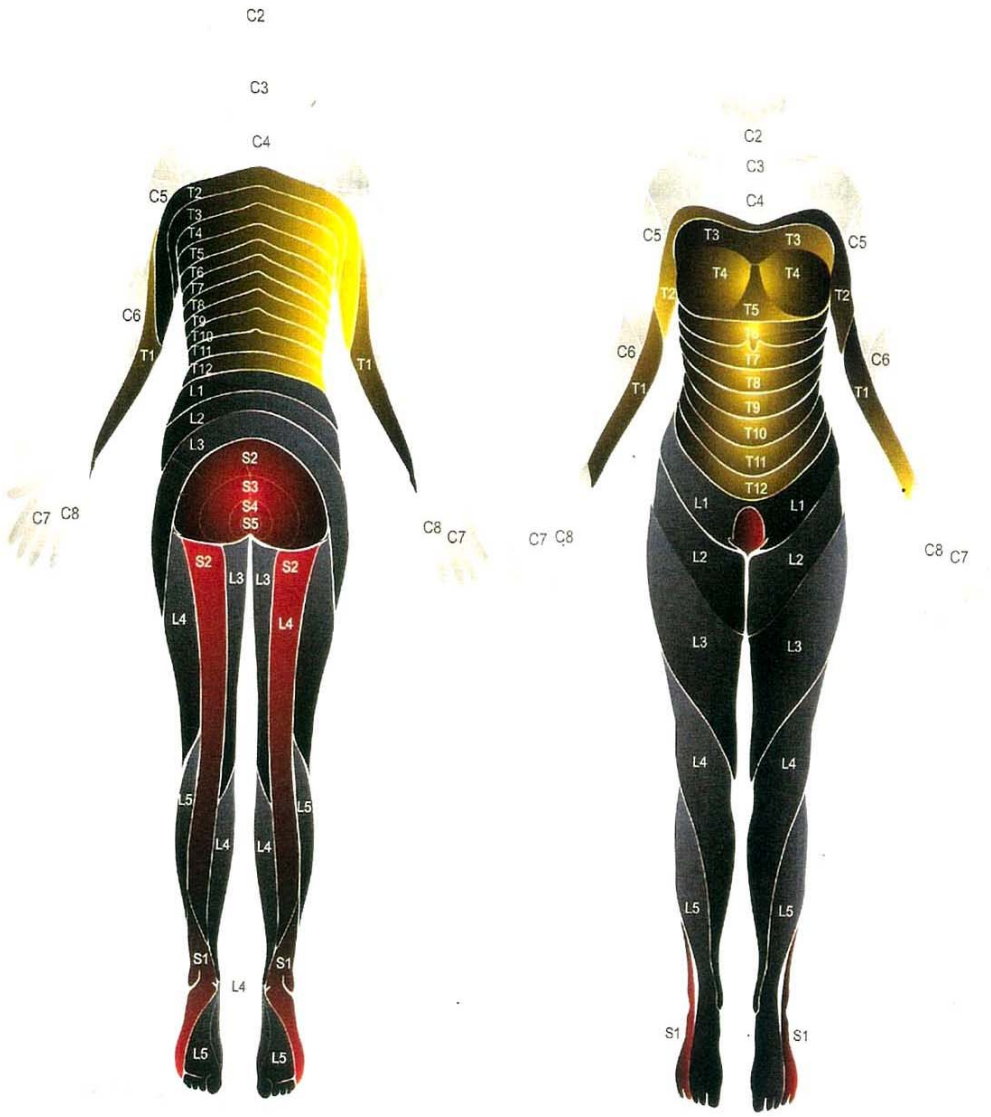
PHYSICAL CHARACTERISTICS OF CEREBROSPINAL FLUID

PH	7.4
Specific gravity	1.007
Density	1.003
Baricity	1.000
Pressure	8-12 mm Hg/70-80 CM H_2O
Cells	3-5 /cu.mm
Proteins	20 mg/dl
Glucose	45-80 mg/dl

The cerebrospinal fluid plays an important role in spinal anaesthesia as a media for dispersion of the local anaesthetic drug to the spinal nerve.

An important factor determining the spread of drugs in subarachnoid space is specific gravity of the injected solution compared with that of CSF.

DIAGRAM OF DERMATOMES



MECHANISM OF SPINAL ANAESTHESIA

Injection of local anaesthetics into the spinal CSF allows access to sites of action both within the spinal cord and the peripheral nerve roots, the nerve roots leaving the spinal canal are not covered by epineurium and are readily exposed to the local anaesthetic with in CSF.

Therefore afferent impulses leaving via ventral nerve roots are blocked during spinal anaesthesia. Spinal local anaesthetics block sodium channels and electrical conduction in spinal nerve roots.

Local anaesthetics can exert sodium channel block within the dorsal and ventral horns inhibiting the generation and propagation of electrical activity.

The order in which nerve fibers are blocked in spinal anaesthesia is preganglionic sympathetic B fibres, followed by temperature fibres (cold before warmth), fibers carrying pin prick sensation, touch, deep pressure and finally proprioception. Motor blockade is the last to occur. Recovery is in the reverse order.

The major factors determining the level of blockade after subarachnoid block are the baricity of the local anaesthetic solution, the position of the patient before and after injection and dose of the anaesthetic agent injected.

FATE OF LOCAL ANAESTHETICS IN SUBARACHNOID SPACE

Following injection of local anaesthetic solution into subarachnoid space, its concentration falls rapidly. The initial steep fall is due to mixing of drug with CSF and subsequent absorption into nerve roots and spinal cord and into blood vessels.

Depending on the type of drug used, it is metabolized in liver or in plasma by pseudocholinesterase. The addition of a vasopressor to the local anaesthetic will retard the absorption of the drug and thus increases the duration of anaesthesia and analgesia.

ADVANTAGES OF SPINAL ANAESTHESIA

- Cost effective
- Excellent analgesia
- Patent airway
- Adequate muscle relaxation
- Minimal blood loss
- Less respiratory complications
- Lower incidence of DVT and Pulmonary emboli.

INDICATIONS OF SUBARCHNOID BLOCK

Spinal anaesthesia can be administered whenever a surgical procedure warrants a sensory level of anaesthesia that does not produce adverse patient outcome.

It is a desired technique for

- Lower abdominal surgeries
- Lower limb surgeries
- Urological procedures
- Obstetrics and gynecological procedures
- Perineal and rectal surgeries

CONTRAINDICATIONS FOR SUBARACHNOID BLOCK

Absolute contraindication :

- Patient's refusal
- Uncorrected coagulopathy
- Uncontrolled blood loss/ shock
- Fixed cardiac output states
- Raised intracranial pressures

Relative contraindications :

- Local sepsis
- Neurological disease
- Major spine deformities /Previous surgery on spine
- Severe cardiac disease

COMPLICATIONS OF SUBARACHNOID BLOCK

Immediate

1. Hypotension
2. Bradycardia
3. Toxicity due to intra vascular injection
4. Allergy to local anaesthetic drug
5. Hypoventilation and Brain stem hypoxia

Late

1. Post dural punctural headache
2. Retention of urine
3. Backache
4. Meningitis
5. Transient lesions of cauda equina
6. Sixth nerve palsy
7. Anterior spinal artery syndrome

SPINAL ANAESTHESIA TECHNIQUE

The first step in successful performance of spinal anaesthesia is proper patient selection.

This is accomplished by pre-anaesthetic evaluation of the patient by thorough history, physical examination, laboratory data and communication with patient and surgical staff about details of the procedure. Reliable intravenous access through large bore intravenous cannula (18G/16G) is mandatory. Preloading limits the severity of hypotension that may result from sympathetic block. The recommended standards for airway management and emergency drugs are kept in readiness.

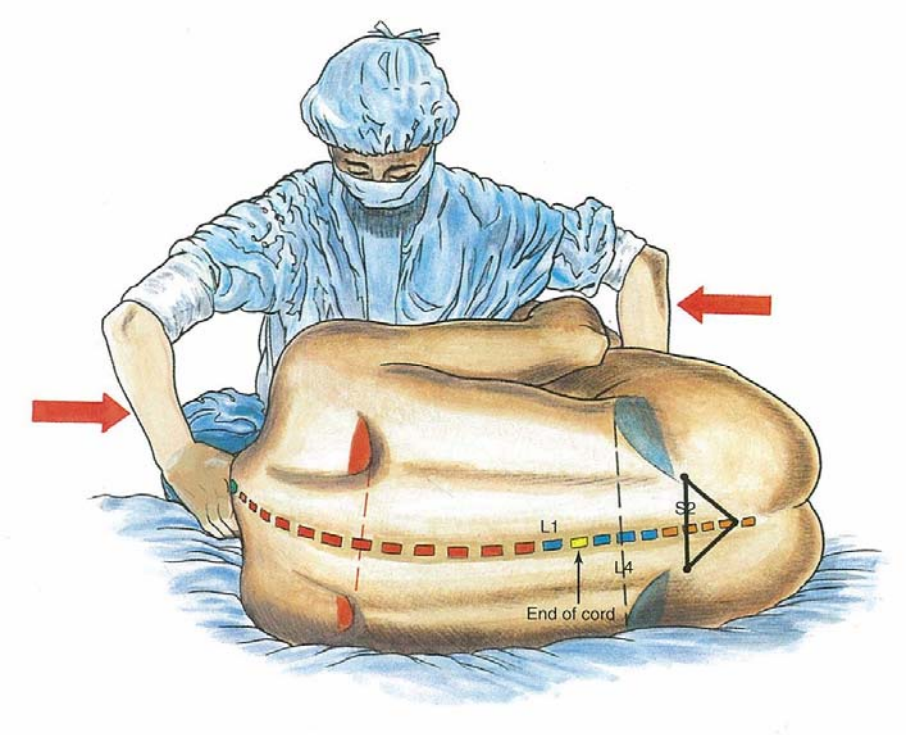
PROCEDURE

PREPARATION

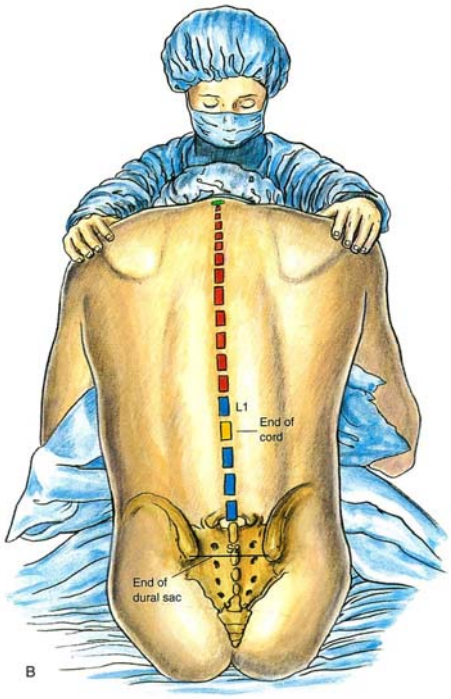
Preparation of equipment and drugs is essential for performing a subarachnoid block.

The choice of drug is based on the type of surgical procedure and the duration of block desired. Spinal needles of various sizes with various types of points are available. Two types of spinal needles available: 1.Quincke-Babcock needle that cut the dural fibres and 2.Greene,Whitacre and Sprotte needle that are designed to separate the dural fibres. To lower the incidence of post dural puncture headache to a

LATERAL DECUBITUS POSITION



SITTING POSITION



minimum, small bore needles with a rounded non-cutting bevel are preferred.

POSITION

The patient can be positioned in any one of the following position, depending upon the surgery proposed.

Lateral decubitus position :

The patient is placed with back parallel to the edge of the operating table close to the anaesthesiologist with neck flexed and thigh flexed upon the abdomen.

Sitting position :

It is choosen when low lumbar and sacral levels of anaesthesia are adequate for the surgical procedure or when obesity or scoliosis makes identification of mid line anatomy difficult in lateral decubitus position or when orthopedic problems of hip and knee exists. Patient made to sit at the edge of the table with legs hanging down with both arms hugging the pillows.

Prone position :

For caudal technique a pillow is used under the anterior iliac crests to rotate the pelvis the legs are spread 20 degrees to ease identification of the sacral hiatus and the heels are rotated laterally to relax the gluteal musculature.

PROJECTION AND PUNTURE

The spinal puncture can be performed either by a midline or a paramedian approach, usually at the L2-L3, L3-L4, L4 –L5 interspaces.

The procedure is carried out under strict aseptic conditions. The patients back is prepared with an antiseptic solution and sterile drapes are applied. A line from the highest point of iliac crest passes through either spinous process of L4 or the L4-L5 interspace. The midline approach with the patient in sitting position/ right lateral decubitus position is used in our study.

Depending on the interspace and approach selected subcutaneous skin wheal is raised over the intended puncture site with local anaesthetic solution. The needle is inserted in the middle of the interface with bevel parallel to the longitudinal dural fibres. After traversing the skin and subcutaneous tissue, the needle is advanced in a slightly cephalad direction with the long axis of the vertebral column. The stylet is removed and appearance of cerebrospinal fluid at the hub of the needle confirms position of the needle tip in the subarachnoid space. Stylet is reinserted to prevent excess leakage of CSF. The hub of the needle is firmly held between the thumb and index finger of the anaesthesiologist's non dominant hand and back of hand held against patients back to steady the needle, while syringe containing anaesthetic solution is firmly attached to the needle.

After confirming, free flow of spinal fluid by aspiration, the anaesthetic solution is injected. The patient is placed in supine position immediately. Cardio vascular and respiratory functions are monitered. Analgesia is checked by loss of sensation to pin prick. Motor block is assessed by modified bromage score.

MECHANISM OF SPINAL HYPOTENSION

One of the most commonest adverse effects of central neurxial blockade is spinal hypotension.

Spinal hypotension is considered when systolic blood pressure falls below 90mm Hg or below 30% from the baseline preoperative systolic blood pressure.

Spinal hypotension is caused due to bilateral sympathetic blockade from T5-L1 where these fibres mainly maintain the vasomotor tone of the arterial and venous smooth muscle. Blocking these nerve fibres causes vasodilatation below the level of blockade leading to venous pooling of blood. Since 70% of blood volume is contained within the venous capacitance vessels there is decreased venous return to the heart leading to decrease in cardiac output producing hypotension.

The effects of vasodilatation can be minimized by compensatory vasoconstriction of veins above the sympathetic blockade. But in cases of high blockade where cardioaccelarator fibres are also blocked (T1-T4) severe hypotension occurs.

THEORIES OF CAUSATION OF FALL IN BLOOD PRESSURE

1. Diminished cardiac output consequent on reduction of venous return to heart, and lack of muscular propulsive force on veins.

   BAINBRIDGE REFLEX: Decreases in venous return results in decreased efferent outflow to the cardio accelerator fibers causing reduction in heart rate and hypotension.

2. Paralysis of sympathetic nerve supply to the heart (T1-T4). Bradycardia may give rise to fall in cardiac output.

3. Paralysis of sympathetic nerve supply to adrenal glands (splanchnic nerves) with consequent catecholamine depletion.

4. Absorption of drug into circulation.

5. Ischaemia and hypoxia of vital centres.

6. Pre existing hypovolaemia if present may give rise to severe fall in blood pressure if central neural blockade is employed.

7. Compression of the great vessel within the abdomen by the gravid uterus, abdominal tumors or abdominal packs may cause severe hypotension in the presence of central neuraxial blockade.

The degree of hypotension dependents upon

(i) Height of the block

(ii) Extent of venous pooling

(iii) Degree of upper extremity vasoconstriction.

Predictors of hypotension :

(i) Height of sensory block(T5 or higher)

(ii) Elderly age group

(iii) Systolic blood pressure < 90mm Hg or 30% decrease from baseline value

(iv) Severe hypertension.

(v) Severe intra vascular volume depletion.

TREATMENT OF HYPOTENSION

Treatment of hypotension should be directed towards the underlying mechanisms of decreased cardiac output and systemic vascular resistance.

Positioning of patient :

Proper positioning will prevent high ascent of the drug avoiding higher level of blockade to produce profound sympathetic blockade.

Fluid management :

(i) Preloading with 10 ml / kg of crystalloids

(2) Intra operative administration of either colloids or crystalloids.

Sympathomimetics :

(i) Ephedrine a both alpha and beta agonist effect increases heart rate and contractility and also produces vasoconstriction.

(ii) Phenylephrine an $alpha_1$ agonist produces arteriolar vasoconstriction, increase the venous tone, increase venous return and increases systemic vascular resistance.

(iii) Epinephrine by direct action increases the vascular tone

Trendelenberg Position :

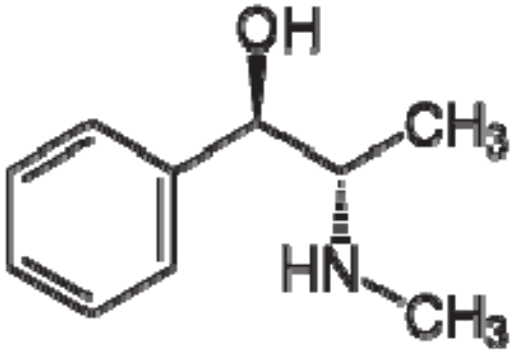
Placing the patient in head down position to produce auto transfusion increases the venous return.

Compression bandages :

With elevation of the leg is done to increase venous return.

EPHEDRINE HYDROCHLORIDE

Ephedrine is an indirect acting synthetic non-catecholamine similar to adrenaline.



PHYSICOCHEMICAL PROPERTIES

PH: 5.3(4.5-7)
Osmolar concenration of 5% solution: 0.35 mosm / ml.
Storage temperature: 15-30˚C

MECHANISM OF ACTION

It stimulates alpha and beta adrenergic receptors. The pharmacological effects of this drug are due to endogenous release of nor epinephrine (indirect acting) but the drug also has direct stimulant effect on adrenergic receptors (direct acting)

METABOLISM

Ephedrine is deaminated in the liver and conjugation occurs. The slow inactivation and excretion of ephedrine are responsible for the prolonged duration of action of this sympathomimetic.

DURATION OF ACTION

Orally it acts within 60 mins, maintains its action for 3-5hrs.

On IV injection, onset of action 3-5 mins, maintains duration of action for 10-15mins.

PRESENTATION

◊ 15/30/60mg tablets

◊ Elixir syrup 3mg / ml

◊ 0.5/1% nasal drops

◊ 30mg | ml injection available as ampoule

SYSTEMIC EFFECTS

Cardio vascular system :

Intra venous administration of ephedrine results in stimulation of alpha receptors there by causing peripheral arterial and venous vasoconstriction.

Stimulation of beta 1 receptor increases the myocardial contractility. As a result there is increase in systolic and diastolic blood pressure, increase in heart rate and increase in cardiac output. Renal and splanchnic blood flows are decreased whereas coronary and skeletal muscle blood flow is increased. Cardio vascular effects of ephedrine hydrochloride resemble those of epinephrine but its systemic blood pressure elevating response is less intense and last approximately ten

times longer. A second dose of ephedrine hydrochloride produce a less intense systemic blood pressure response than the first dose, this phenomenon is known as tachyphylaxis, which occurs with many sympathomimetics and is related to the duration of action of these drugs.

Tachyphylaxis probably represents a persistent blockade of adrenergic receptor. Ephedrine hydrochloride induced activation of adrenergic receptor persist even after systemic blood pressure returns to near predrug levels by virtue of compensatory cardio vascular changes. When the second dose of ephedrine hydrochloride is administered at this time, the receptor sites still occupied by ephedrine hydrochloride limits the available receptors and the blood pressure response is less. Alternatively tachphylaxis may be due to depletion of norepirephrine stores.

Central nervous system :

Stimulation of the cerebral cortex and medulla produces alertness, anxiety, tremor, twitching and insomnia.

It stimulates the spinal cord and enhances spinal reflex. It crosses blood brain barrier and increases MAC.

Respiratory system :

It produces bronchodilation and increases the respiratory minute volume

Gastrointestinal system and urinary system :

Increases sphincter tone of bladder and alimentary tract. It relaxes smooth muscle of gastrointestinal tract and the bladder.

Uterus:

It does not alter the uterine blood flow .

DOSE:

Oral 30-50mg by mouth

In adults IV bolus 2.5-10mg

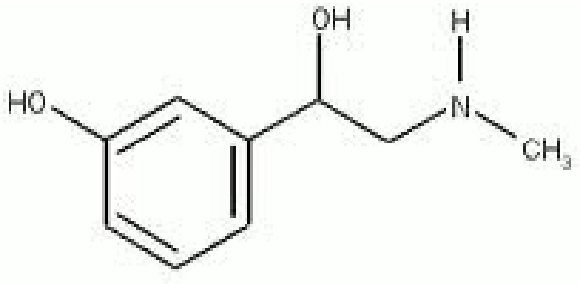
In children IV bolus 0.1mg | kg

CLINICAL USES

1. To increase the systemic blood pressure in the presence of sympathetic nervous system blockade produced by regional anaesthesia or hypotension due to inhaled or injected anaesthetics.
2. Activation of beta $_2$ adrenergic receptor causes bronchodilatation, hence used in the treatment of bronchial asthma.
3. Decongestant effect produces symptomatic relief from acute coryza.

PHENYLEPHRINE HYDROCHLORIDE

Phenylephrine is a direct acting synthetic non-catecholamine sympathomimetic vasopressor drug chemically related to adrenaline and ephedrine.



PHYSICOCHEMICAL PROPERTIES

PH: 3-6.5

Storage temperature: 15-30^{0}C

MECHANISM OF ACTION

It acts mainly on the α_1 adrenergic receptors by direct effect.Action on α_2 adrenergic receptor is less. Dose to stimulate α_1 receptor is less than required to stimulate α_2. Only in very large doses it will have minimal – β adrenergic activity.

It is a powerful post synaptic α receptor stimulant.

PHARMACOLOGICAL ACTIONS

- IV administration causes rise in systolic and diastolic blood pressure.
- It is a powerful venoconstrictor than arteriolar constriction causing rise in systemic vascular resistance.
- It produces reflex bradycardia but increase stroke output.
- Most vascular beds are constricted; renal, splanic, cutanous and limb blood flows are reduced but coronary blood flow is increased.
- Pulmonary vessels are constricted and pulmonary arterial pressure is raised.

METOBOLISM

It is metabolized in the liver by monoamine oxides.

DURATION OF ACTION

The action of IV Phenylephrine starts within 1 to 2 min after administration and effective for about 20 minutes. Pheny lephrine when given SC / its onset takes about 10 – 15 mins and effective for about 1 - 2 hours.

DOSAGE

sc / im 2 to 5 mg further doses of 1 to 10 mg

IV 50 – 200microgms slow IV as 0.1% solution repeated at 20 minutes interval .

An IV infusion containing 10 mg of phenylephrine in 500ml of 5% glucose or 0.9%NS started at a rate of 180 micro gm / min and later reduced to 30-60- micro gm/ min according to the response.

CLINICAL USES

1. Used to treat spinal hypotension .
2. Hypotension due to peripheral vasodilatation produced by administration of injected or inhaled anesthetics.
3. Useful in patients with coronary artery disease, in aortic stenosis and mitral stenosis patients. It increases coronary perfusion pressure without chronotropic side effects.
4. Used as a continuous infusion (20 to 50 microgm/ min) in adults to sustain systemic blood pressure at normal levels during carotid endartectomy. It slows the heart rate in case of supra ventricular tachydysrhythmias.
5. On topical application, phenylephrine is used as nasal decongestant and produces mydriasis without cycloplegia.
6. Effective in prolonging spinal anaesthesia when added to local anaesthetic solution that are placed in the subarachroid place.
7. Administration of phenylephrine by infusion during caesarean section to maintain maternal systolic blood pressure is associated with a lower incidence of fetal acidosis than ephedrine.

8. Repeated injection produces comparable effects which is an added advantage of this drug.

SIDE EFFECTS

Cardio vascular effects :

1. In case of IV injection of phenylephrine given to patients with coronary artery disease causes transient impairement of left ventricular global function.
2. Renal, Splanic, Cutanous blood flow decreased.
3. Pulmonary artery pressure increased.
4. Reflex bradycardia
5. Headache

Metabolic Effects :

Stimulation of alpha receptors by a continuous infusion of phenylephrine during acute potassium loading interferes with the more movement of potassium ions across cell membrane into cells.

CONTRAINDICATIONS

1. MAO inhibitors within 14 days
2. Severe HT
3. Ventricular tachycardia
4. Hyperthyroidism
5. Aortic valvular incompetence

PRECAUTIONS

1. IHD
2. Cardiac arrythmias
3. Occlusive vascular disease
4. Angina pectoris
5. Hyperthyroidism
6. Severe arteriosclerosis

DRUG INTERACTIONS

1. Induces Ventricular fibrillation in patients receiving cyclo propane, halothane.
2. Cardiac arrythmias in patients receiving glycoside and quinidine

PREPARATIONS

Inj.Phenylephrine 10mg/ml

Nasal solution 0.125%, 0.25%, 0.5%, 1%

Opthalmic solution 0.12%, 2.5%, 10%

Chewable tablets 10 mg

REVIEW OF LITERATURE

Anna Lee et al[1] compared the effects of phenylephrine and ephedrine to manage hypotension during spinal anaesthesia for elective caeserean delivery. Woman given ephedrine had neonates with lower umbilical cord blood pH values compared with those given phenylephrine. Both groups had similar efficacy for preventing or treating hypotension and there was no difference in clinical neonatal outcome as measured by Apgar scores. But the risk of maternal bradycardia. (responsive to atrophine) was larger than in those women given ephedrine.

Brooker et al[2] compared the effects of phenylephrine and epinephrine in the treatment of hypotension after hyperbaric Tetracaine spinal anaesthesia. A prospective double blind randomized cross – over study design, 13 patients received infusion of epinephrine and phenylephrine to manage hypotension after hyperbaric tetracaine. Blood pressure, heart rate and stroke volume (measured by Doppler echocardiography using the transmitral time – velocity integral) were recorded at base line, 5 mins after injection of tetracaine and before and after management of hypotension.

Phenylephrine was effective at restoring systolic blood pressure after SAB (120 $\pm$ 6 mm Hg to 144 $\pm$ 5mm Hg $p < 0.001$) but associated with decreased heart rate (80 $\pm$ 5 beats / min to 60 $\pm$ 4 beats / min $p < 0.001$) and cardiac output (8.6 $\pm$ 0.7 L / min to 6.2 $\pm$ 0.7 L / min

p <0.003) Epinephrine was effective at restoring. systolic blood pressure (119 $\pm$ 5mm Hg to 139 $\pm$ 6mm Hg p< 0.001) cardiac output (7.8 $\pm$ 0.6 L / min to 10.8 $\pm$ 1.1L / min p < 0.001).

They concluded that ephinephrine increased heart rate, cardiac output and restored systolic blood pressure and phenylephrine decreased heart rate decreased cardiac output and restored systolic and diastolic blood pressure.

Adrienne Stewart et al[3] studied the dose – dependent effects of phenylepherine for elective caesarian delivery under SAB.

A Randomized double blind study was done in 75 women scheduled for elective caesarean delivery were allocated to receive a phenylephrine infusion at 25microgm / min, 50microgm / min, 100microgm / min. This infusion was titrated to maintain maternal baseline systolic blood pressure from induction of spinal anaesthesia until delivery. Heart rate, systolic blood pressure, cardiac output, stroke volume (Suprasternal Doppler moniter) and venous return measured (Corrected flow time) and contractility were recorded from baseline and then every 5 mins for 20mins after initiation of spinal anaesthesia. Apgar scores and umbilical and blood gases were recorded.

They concluded that systolic blood pressure was controlled satisfactorily in all groups. But when infusing higher concentration (100microgm/min) mother and fetus were subjected to higher dose of

phenylephrine with significant effects on maternal heart rate and cardiac output (up to 20% reductions) . Apgar scores and umblical cord blood gases were similar among groups.

Paul cly burn et al[4] showed that maternal hypotension when treated with large doses of ephedrine contributed to decreased umbilical cord pH, but phenylephrine produced less depression of cord pH than ephedrine. The explanation for this is ephedrine displays tachyphylaxis and frequently large doses are required to treat hypotension. It has a slow onset of action and is not ideal in treating sudden hypotension. Ephedrine crosses the placenta, it is possible that acidosis is the result of a direct fetal effect.

In order to minimize the risk of fetal acidosis, prophylactic phenylephrine infusion was started immediately after spinal injection and maintained systolic blood pressure. If heart rate falls below 80 beats/ min glycopyrronium was administered

Warwick D Nagan kee[5] studied the methods of managing spinal hypotension for caesarian section. He concluded that phenylephrine was more effective and can be titrated more easily than ephedrine and it has a less depressive effect of fetal pH and base excess. It may be given as boluses (50-100microgm) or by infusion (50-100microgm / min). Current evidence suggests that infusion are best titrated to maintain maternal blood pressure near to base line values.

Kocarev et al[5] studied the equivalent dose of ephedrine and phenylephrine in the prevention of post spinal hypotension in caesarean section. They determined the minimum vasopressor dose for each of these drugs to calculate the dose ratio for clinical equivalence in the prevention of hypotension.

Patients undergoing elective caesarean section under spinal anaesthesia were randomized into two groups. Group A received 50mg of ephedrine in 0.9% normal saline 500ml at 999ml/hr Group B received 500microgm of phenylephrine in 0.9%normal saline 500ml at 999 ml / hr.

They derived at a conclusion that the minimum vasopressor dose in saline was 532.9microgm for phenylephrine and 43.3mg for ephedrine, potency ratio of 81.2 for equivalence between phenylephrine and ephedrine in prevention of spinal hypotension.

Cooper David et al[7] studied the fetal and maternal effects of phenylephrine and ephedrine during spinal anaesthesia for caesarean section.

The study was randomized and double blind. It compared phenylephrine 100microgm / ml (Group P) ephedrine 3 mg / ml (Group E) and phenylephrine 50 microgm / ml combined with ephedrine 1.5 mg/ml (Group P/E) given by infusion to maintain systolic blood pressure. The study result showed that foetal acidosis was less frequent in Group P (1 in 48) ($p=0.004$) and in Group P/E (1 in 47) ($p=0.005$) than in

ephedrine group (10 of 48). The systolic blood pressure was maintained in Group P median 98% of baseline, Group E 100% of base line ,Group P/E 101% of baseline.

The mean heart rate was higher in the Group E than with Group P ($P<0.0001$) nausea and vomiting was less frequent in the Group P (Nausea 17% vomitting 0%) Group E (Nausea 66% vomitting 30%) Group P/E (Nausea 55% vomitting 18%).

They concluded that phenylephrine alone by infusion was associated with lower incidence of fetal acidosis and maternal nausea and vomitting than giving ephedrine alone.

The combination group had no advantage but increased nausea and vomitting.

Loughrey JP et al[8] studied phenylephrine and ephedrine in combination and ephedrine alone in the management of spinal hypotension in caesarean patients.

43 term parturients were randomized to receive a bolus of ephedrine 10mg or ephedrine 10mg + phenylephrine 40 microgm. They concluded that ephedrine and phenyl ephrine given as an IV bolus at the doses selected were not superior to ephedrine alone in treating hypotension.

Dinesh et al[9] compared the effects of phenylephrine, ephedrine and mephentermine for maintenance of arterial pressure during spinal

anaesthesia in caesarean section. 60 patients posted for elective / emergency LSCS under SAB who developed spinal hypotension were allocated into 3 groups. Each group (n=20), Group P received phenyl ephrine 100 microgm IV bolus, Group E received ephedrine 6 mg IV bolus, Group M received mephentermine 6 mg IV bolus.

In the above study all three vasopressors effectively maintained arterial pressure within 20% limit of base line value though systolic BP elevation was high in phenylephrine in first 6 mins of bolus. Phenylephrine has a peak effect within one minute, ephedrine 2-5 mins, mephentermine 5 min. Phenylephrine 100 microgm is as effective as ephedrine 5 mg in restoring arterial pressure >100 mm Hg. Neonatal apgar scores were >7 in all three groups.

Phenylephrine decreases heart rate significantly which may be advantage in cardiac patients and patients in whom tachycardia is undesirable.

Niranjan Maitra et al[10] did a comparative study of phenylephrine and mephentermine to increase the arterial blood pressure in spinal hypotension for caesarean section.

Ephedrine has been used as the agent of choice in treating spinal hypotension but the position has been challenged because of its potential to cause supra ventricular tachycardia, tachyphylaxis and fetal acidosis.

The study group of 90 (n=45) each of the group received either phenylephrine 100 microgm or mephentermine 6mg on developing hypotension,G roup P showed higher systolic blood pressure than Group M and the mean diastolic pressure was significantly higher in Group P in comparison to Group M. Heart rate decreased significantly in Group P whereas it remained high in Group M and was statistically non-significant with values at the onset of hypotension till 30 mins. The systolic blood pressure shows peak effect of phenylephrine to occur after 6 mins while that of mephentermine after 4 minutes. The incidence of nausea and vomiting and other effects was comparable between two groups. The apgar scores at 1 and 5 min was also statistically not significant between the groups.

The conclusion was that both phenylephrine and mephentermine maintain systolic blood pressure above hypotensive range though phenylephrine might be better because number of doses needed is less and it increases diastolic blood pressure more than mephentermine and hence mean arterial pressure is increased. Thus it can probably enhance organ blood flow more than mephentermine. Mephentermine increases heart rate and thus may be avoided in population where the effect may be detrimental.

Edno magalhaes et al[11] studied the effects of phenylephrine and ephedrine in the treatment of spinal hypotension and their effects on the foetus. 60 patients undergoing spinal block with bupivacaine and

sufentanil for caesarean section were randomly divided into two groups to receive prophylactic ephedrine (Group E, n=30 dose =10mg) or phenylephrine (Group P, n=30, dose=80mg) immediately after SAB. 50% of the initial dose of vasopressor was given when there was fall in blood pressure lower than 80% of base line values.

Results showed that Group P patients had higher systolic BP. The incidence of nausea and vomitting for Group E was 7 and 4 and that for Group P was 10 and 6. The incidence of reactive hypertension was similar; 5 in Group E and 4 in Group P. Only one patient in Group P developed bradycardia. The above differences were not statistically significant. In Group P 28 patients developed hypotension and in Group E 21 patients developed hypotension. This difference was statistically significant ($P<0.05$). The number of episodes of hypotension was significantly higher in Group P(80 episodes) than in GroupE (29 episodes) ($P<0.05$) . Group E had a higher proportions of new borns with Apgar scores in 1 min was lower than 8 than in Group P and thus was statistically significant ($P < 0.05$) As for arterial and venous umbilical cord blood gases mean pH in Group E is 7.22 and Group P is 7.27 P 0 < 0.05 and is statistically significant.

Mercier FJ et al[12] studied the effect of phenylephrine added to prophylactic ephedrine infusion during spinal anaesthesia for elective cesarean section. 39 parturients with ASA I-II scheduled for caesarean delivery received crystalloid preload 15ml / kg, After giving SAB a

vasopressor infusion was started immediately after spinal injection of either 2mg / min ephedrine plus 10microgm / min phenylephrine or 2 mg / min ephedrine alone.

When there was fall in systolic BP 6mg ephedrine bolus doses given. Hypotension occurred less frequently in ephedrine- phenylephrine group than in ephedrine alone. 37% VS 75% (p=0.02) median supplemental ephedrine requirement and nausea scores (0-3) were less in the ephedrine – phenylephrine group. Umbilical artery pH values were higher in ephedrine-phenylephrine group than in ephedrine alone group. Apgar scores were similarly good in both groups. They concluded phenylephrine added to infusion of ephedrine halved the incidence of hypotension and increased umbilical cord pH.

Deborah H. Moran et al[13] compared phenylephrine and ephedrine in the prevention of maternal hypotension following SAB. 60 healthy patients electively scheduled for caesarean delivery under spinal anaethesia of which Group E (n=29 dose = 10mg IV bolus) and Group P (n=31 dose 80 microgm IV bolus) were given to maintain systolic blood pressure >100mm Hg.

In Group E umbilical artery pH was 7.28 $\pm$ 0.01; umbilical artery Pco2 was 56.6 $\pm$ 1.4 mm Hg; umbilical artery base deficit was 2.2 $\pm$ 0.04meq; In Group P umbilical artery pH was 7.32 $\pm$ 0.01; umbilical artery Pco_2 was 52.1 $\pm$ 1.3 mm Hg. Umbilical artery base deficit was 0.38 $\pm$ 0.35 meq. There were significant differences between the groups in pH,

Pco2, base deficit although values obtained were within normal limits. There was no differences between the groups in Neonatal apgar scores. Early neonatal neuro behaviour scale score or maternal nausea and vomiting. They concluded that phenylephrine is as effective as ephedrine in treatment of maternal hypotension when used in small incremental bolus doses.

R.F.La Porta et al[14] studied the effects of phenylephrine and ephedrine for maternal hypotension. 40 patients undergoing caesarean section divided into 2 groups Group E (n=20; dose 5mg IV bolus) Group P (n=20; dose 40microgm IV bolus) whenever there is fall in maternal systolic BP to maintain systolic BP>100mm Hg.

They studied that noradrenaline concentrations in umbilical artery, umbilical vein and maternal vein was higher in Group E than Group P patients. They were 6858 $\pm$ 3689 VS 1674 $\pm$ 944 pg / ml; ($P<0.0001$) 1265 $\pm$ 758 VZ 395 $\pm$ 470 pg / ml ($P<0.001$) and 239 $\pm$ 165 VS 103 $\pm$ 93pg / ml ($P<0.01$) Comparing blood gas values between Group E and Group P, Statistically significant differences were observed. The Group E had higher values, there was no difference in Apgar scores and incidence of nausea and vomitting.

Phenylephrine appears safe in treating maternal hypotension and was significantly associated with lower noradrenaline concentrations in mother and neonate.

Nishikawa K et al[15] studied the use of prophylactic i.m phenylephrine to prevent spinal induced hypotension in surgical repair of hip fracture in the elderly.

90 patients aged >65 years undergoing surgery for hip fracture under hyperbaric tetra caine spinal anaesthesia were divided as follows. 45 normotensive pts (15=1.5mg PE) (15=3mg PE) (15=normal saline) 45 hypertensive patients (15=1.5mg PE) (15=3mg PE) (15=normal saline). All the patients received the drug prophylatically. The incidence of hypotension (>25% decrease in MAP from base line) was significantly lower in the patients who received phenylephrine 1.5 or 3 mg than the control groups. Both in normotensive and hypertensive group ($p < 0.01$). the normotensive patient who received 3mg and 1.5mg and hypertensive patients who received 3mg had significant lower percentage reduction MAP ($p<0.05$) and required smaller doses of rescue IV ephedrine than with other groups.

Bradycardia (heart rate <50bpm) as an adverse effect after i.m administration of phenylephrine was not observed in any groups. Hypertension occurred in normotensive and hypertensive patients who received 3 mg im but not with 1.5 mg im. Studies concluded that phenylephrine 1.5mg im given prophylactically was safe with no adverse effects.

M. Tanaka et al[16] determined the 95% effective dose of phenylephrine by intermittent IV bolus to prevent spinal hypotension and / or nausea at elective caesarean delivery.

50 patients undergoing elective ceasarean delivery under SAB were selected. The dose of phenylephrine was determined using up-down sequential allocation. The first patient was assigned a 40microgm dose and the dose to subsequent patients varied by 10microgm increments or decrements. An adequate response was defined as absence of hypotension (SBP <80% of base line) and nausea.

The ED95 of phenylephrine was estimated as 159microgm although least is 120microgm and they concluded ED95 of phenylephrine is at least 122microgm.

E.T. Riley[17] had studied the advantage of using phenylephrine in preventing maternal spinal hypotension over ephedrine. As ephedrine leads to foetal acidosis the aggressive use of phenylephrine and other pure alpha vasoconstrictors is apparently the best practice.

In case there is bradycardia associated with high spinal or the reflex bradycardia associated with the use of phenylephrine the use of a mixture of ephedrine and phenyl ephrine will keep the heart rate up and the dose of ephedrine low enough not to be detrimental to the fetus.

W.D. Ngan kee et al[18] did a randomized double blinded comparison of phenyl ephrine VS ephedrine for maintaining blood

pressure during spinal anaesthesia for non- elective caesarean section. Inj phenylephrine 100 microgms VS Ephedrine 10mg for treating hypotension (SBP < 100 mm Hg) in 204 pts were studied .Umbilical artery and venous pH and base excess were similar between groups. In the ephedrine group umbilical artery lactate concentration was higher (2.6 VS 2.4mmol / L p=0.002) and umbilical vein lactate concentration was also higher (2.5 VS 2.3 m mol/ L p=0.016). There was also more incidence of nausea and vomiting. Clinical neonatal out come was similar. The umbilical artery and vein Po2 were lower in the phenylephrine group although oxygen content was similar. They concluded that phenylephrine and ephedrine are both suitable vasopressor.

Yoon HJ et al[19] compared the effects of ephedrine, phenylephrine and combination infusion on maternal and fetal effects on spinal hypotension for caesarean delivery. Thirty two parturients were randomized into 3 groups to receive ephedrine, phenylephrine or combination infusion (Group E, Group P and Group EP) starting with spinal anaesthesia.

Parameters such as systolic blood pressure, pulse rate , cardiac index, systemic vascular resistance index were measured before and until 15 mins after spinal anaesthesia. Rescue boluses for hypotension comprised of phenylephrine 100 microgm. Results showed there were no statistically significant differences in all parameters among three

groups. However 1 min Apgar score in the Group E was significantly lower than Group (P=0.008).

Nausea, vomiting, umbilical vein pH and 5 min Apgar score showed no difference. Three methods are all effective to prevent hypotension. However 1 min Apgar score of ephedrine group was significantly lower than that of phenylephrine alone group.

Girish sadhu et al[20] studied the effect of vasopressor on the uterine blood flow. Recent evidence has shown that maintaining blood pressure near baseline was associated with best outcome for the baby with fewer side effects for the mother.

Recent evidence has shown that doses of ephedrine large enough to maintain hemostasis after induction of SA may be detrimental in foetal acidosis, tachycardia and variable foetal heart rate. Ephedrine caused significant hypertension and tachycardia when used to treat spinal hypotension. Smaller doses of phenylephrine required when compared to ephedrine does not cause increase in foetal acidosis. This may be due to decreased sensitivity of uterine blood vessels to vasopressors in pregnancy and preferential shunting of blood from peripheries to the uterine vessels. It dose not cause maternal tachycardia but does cause bradycardia as a physiological effect. This may not be detrimental to the mother / baby if blood pressure is maintained.

M.C.Hennebry[21] studied the effect of I.V phenylephrine or ephedrine on the ED50 of intrathecal bupivacaine with fentanyl for caesarean section. Prophylactic infusion of phenylephrine to prevent hypotension at caesarean section has been shown to decrease the roastral spread of intrathecal plain levobupivacaine and intrathecal hyperbaric bupivacaine by a median of two dermatomes compared with ephedrine . The ED50 dose of bupivacaine with phenylephrine was 7.8 mgs and with ephedrine it was 7.6mg. systolic BP was maintained similar in both groups.

MATERIALS AND METHODS

STUDY DESIGN

This is a prospective double blinded randomized study.

This study was conducted at Chengalpattu Medical College Hospital, Chengalpattu – between May 2010 and October 2010 after obtaining approval from the ethical committee and written informed consent from all patients included in this study.

An anaesthetic consultant who does not take part in the study will draw inj.phenylephrine hydrochloride and inj. ephedrine hydrochloride and code the syringes .He will select patients by drawing lots from the operation theatre list for that particular day.

An anaesthesia resident will conduct the spinal anaesthesia and collect data for the study. Total patients were 100 of ASA I & II undergoing inguinal hernia and lower limb orthopedic surgeries.

SELECTION OF CASES

Inclusion criteria:

ASA I & II

Age 20 -50 years

Both Sexes

Exclusion criteria:

ASA III – V

Bleeding diasthesis

Patient on anticoagulants

PATIENTS GROUPS

Patients were divided into two groups.

Group – P (Patients who will be treated with inj. Phenylephrine hydrochloride 100 micrograms IV bolus).

Group – E (Patients who will be treated with inj.Ephedrine hydrochloride 6 mg IV bolus)

Each group will have 50 patients.

A drop in the pre operative base line systolic blood pressure by 30% of its pre operative base value is taken as a point when the patients were treated with either inj. phenylephrine hydrochloride or inj.ephedrine hydrochloride in our study.

The data collected were assessed statistically.

PRE ANAESTHETIC EVALUATION

Patient included in the study underwent thorough pre-operative evaluation which included a history of:

1. Underlying medical illness
2. Previous Surgery
3. Anaesthesia and hospitalization.
4. Drug intake.

Physical Examination :

1. General condition of the patient.
2. Height and weight
3. Examination of CVS,RS for vital signs
4. Examination of CNS and Spine.
5. Airway assessment.

Investigations:

Hb, PCV, BT, CT, blood sugar ,blood grouping and crossmatching, RFT, ECG, Chest X-ray were done as per the patients surgical requirement.

Patients were advised over night starvation.

Technique :

Patients were premedicated with tablet midzolam 7.5 mg orally 2 hours prior to surgery with a sip of water.

IV line secured over the left forearm using a 18G IV cannula and was preloaded with Ringer's lactate 10 ml/ kg which was started and ended within one hour before the spinal blockade.

Anaesthesia machine and drug trolley including emergency drugs were checked. The level of operating theatre table was checked to be horizontal.

Patient was shifted on a transfer trolley into the operation theatre and were connected to NIBP, SPO_2 5 lead ECG monitors. The pre operative base line values of systolic, diastolic and mean arterial blood pressure , and SPO_2 were recorded in supine position .

Then the patient was positioned in the right lateral position and a midline lumbar puncture was performed using 23G Quincke spinal needle at L_2L_3 space after following a local infiltration with 1ml of 2% lignocaine under strict aseptic precautions. All patients were given 0.5% Bupivacaine heavy 3ml. The patient was repositioned to supine position

INTRAOPERATIVE DATA

The data systolic pressure, diastolic pressure, mean arterial pressure, heart rate and SPO_2 were recorded every minute for 5 minutes and the same parameters were planned to be recorded at every 5^{th} minute for 60 minutes. Whenever the patient's systolic blood pressure falls below 30% from the baseline value **Group P** was given inj. phenylephedrine hydrochloride100 micrograms IV bolus and **Group E** was given inj. Ephedrine hydrochloride 6mg IV bolus.

For those patients who had a drop in systolic blood pressure below 30% of baseline value, systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate, SPO_2 were recorded at an interval of 1 minute, 3 minute, 5 minute, 10minute, 20 minute, 30 minute, 45 minute, and 60 minute .

Side effects like headache , nausea and vomiting were observed and data collected.

The data collected were assessed statistically.

OBSERVATIONS AND RESULTS

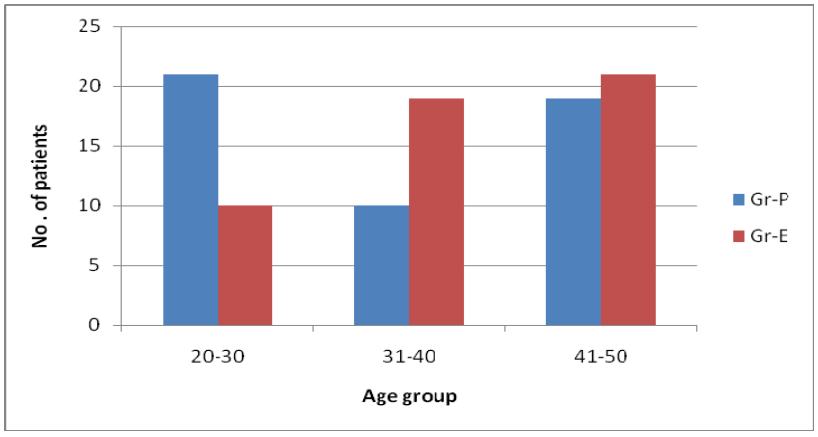
STATISTICAL ANALYSIS

All collected data were entered into computer using MS Excel software and analysed using STATA software. Descriptive analysis presented in the form of Tables and Graphs. The level of significance was 0.05 used for determining the significance of different variable. Student 't' test was used to determine the significance of quantitative variables of demographic data like preoperative, intraoperative and postoperative systolic blood pressure(SBP),diastolic blood pressure(DBP), mean arterial pressure(MAP) and heart rate(HR).

DEMOGRAPHIC DATA

Distribution of patients by Age group

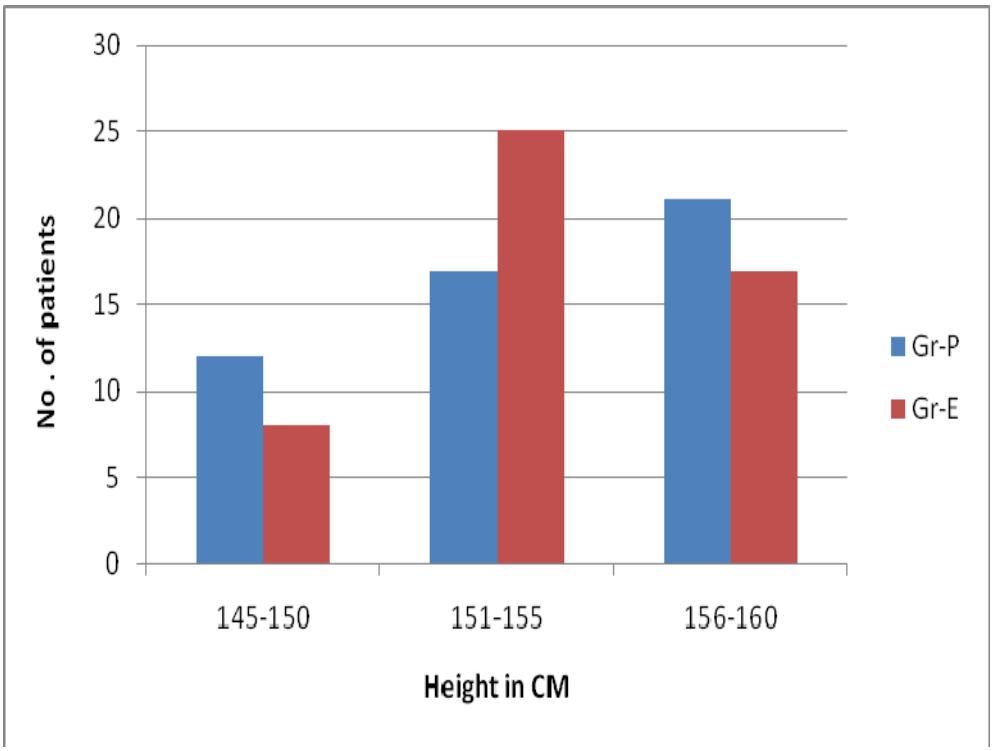
Age	Group-P	Group-E
20-30	21	10
31-40	10	19
41-50	19	21



Mean and standard deviation of **age of Group-P and Group- E** patients are 35.4, 38 and 10.5, 9.5 respectively which is not statistically significant (p >0.08). The two groups are comparable at the start of surgery.

Distribution of patients by Height in cm :

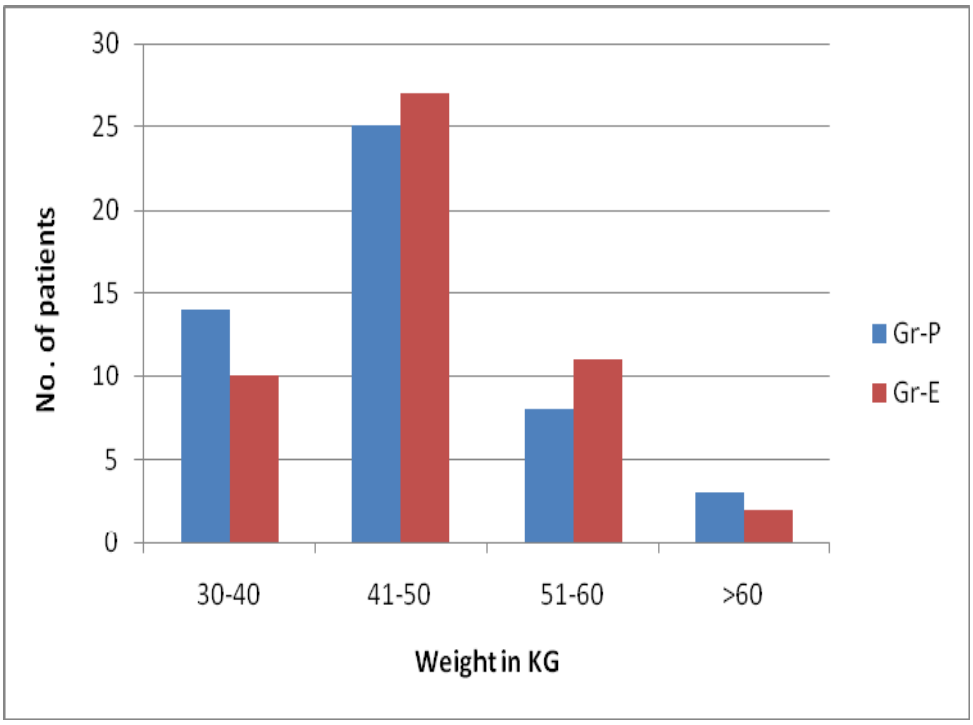
Height in cm	Group-P	Group-E
145-150	12	8
151-155	17	25
156-160	21	17



Mean and standard deviation of **Height of Group-P** and **Group-E** patients are 154, 154 and 3.6, 3.2 respectively which is not statistically significant(p >0.90). The two groups are comparable at the start of surgery.

Distribution of patients by weight :

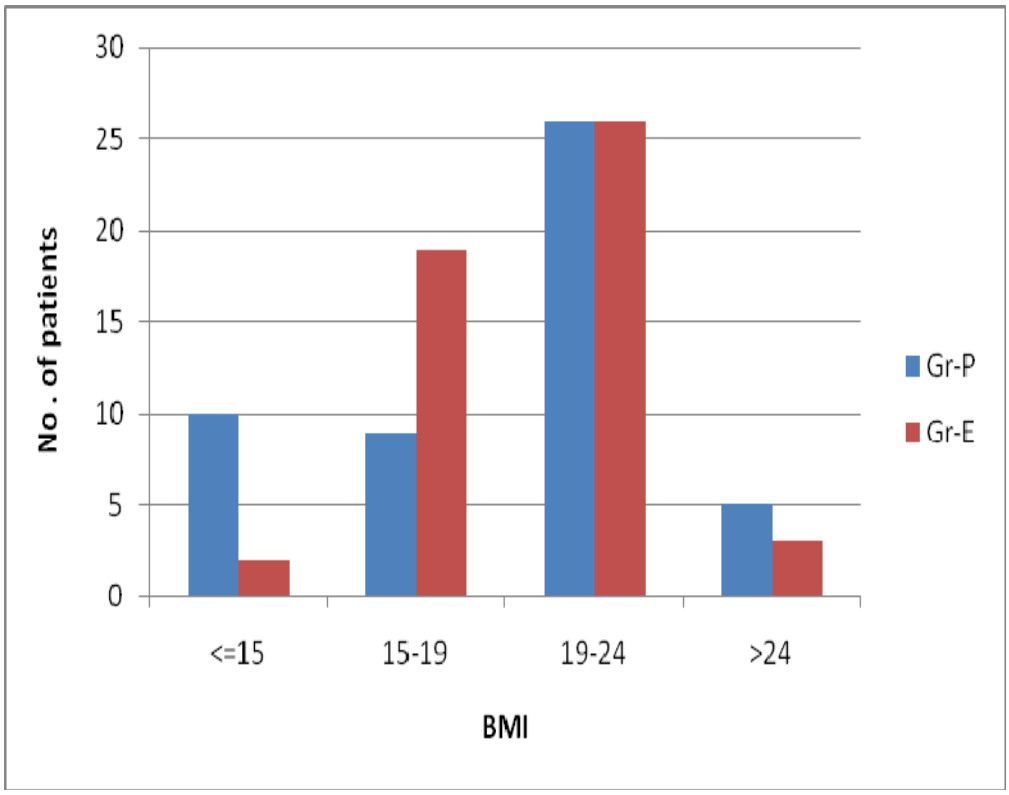
Weight in kg	Group-P	Group-E
30-40	14	10
41-50	25	27
51-60	8	11
>60	3	2



Mean and standard deviation of **Weight of Group-P** and **Group-E** patients are 45.7, 46.9 and 11.4, 7.4 respectively which is not statistically significant(p >0.50). The two groups are comparable at the start of surgery.

Distribution of patients by BMI group :

BMI	Group-P	Group-E
<=15	10	2
15-19	9	19
19-24	26	26
>24	5	3



Mean and standard deviation of **BMI of Group-P** and **Group-E** patients are 19.4, 19.8 and 5, 3 respectively which is not statistically significant(p >0.60). The two groups are comparable at the start of surgery.

Distribution of average SBP Within 5 mts of SAB and 1st minute after giving vasopressor :

Time	Group-P	Group-E	P value
Baseline	116	117	0.86
1min	123	121	0.5
2min	108	107	0.75
3min	93	94	0.72
5min	85	89	0.21
1 min after vasopressor	150	112	0.0001

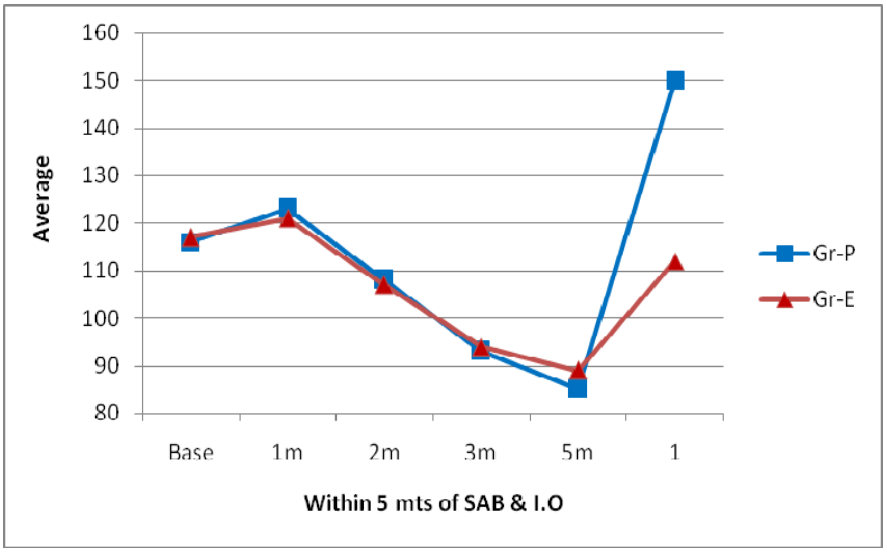


Table and Figure shows that **Within 5 minutes of SAB,** there is no significant difference between **Group-P** and **Group-E** on drop of average SPB at different minutes.

But after administering the drug, the '**P'** group shows very high average SBP compared to **Group-E which is statistically highly significant (p<0.0001).**

Distribution of average DBPwithin 5 mts of SAB and 1st minute after giving vasopressor :

Time	Group-P	Group-E	P value
Baseline	74	74	0.81
1min	77	77	0.9
2min	68	69	0.51
3min	60	59	0.37
5min	55	56	0.71
1 min after vasopressor	90	71	0.0001

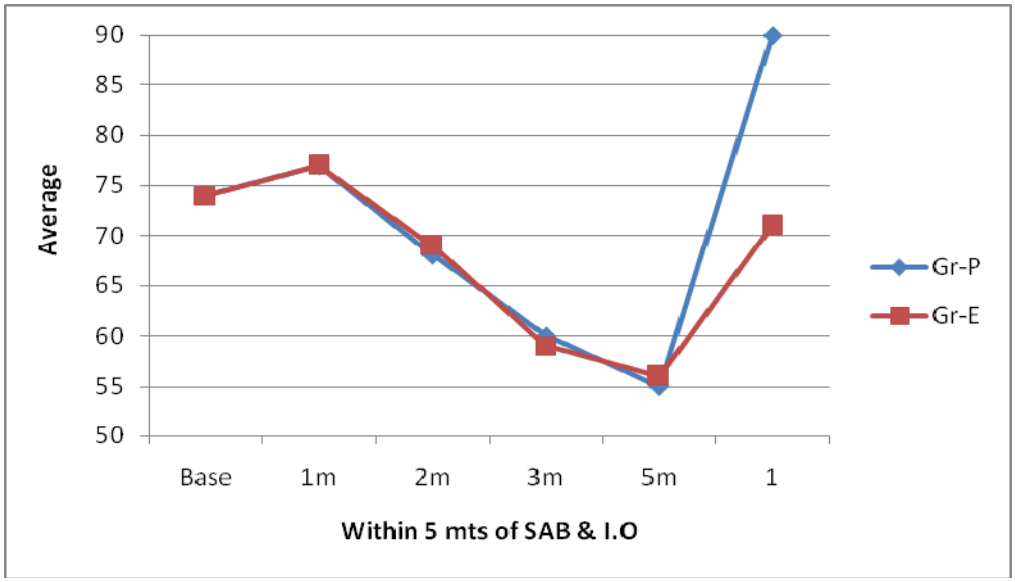


Table and Figure shows that **Within 5 minutes of SAB,** there is no significant difference between **Group-P** and **Group -E** on drop of average DBP at different minutes.

But after administering the drug, the '**P'** group shows very high average DBP compared to **Group-E which is statistically highly significant (p<0.0001).**

Distribution of average MAP within 5 mts of SAB and 1st minute after giving vasopressor :

Time	Group-P	Group-E	P value
Baseline	88	88	0.9
1min	92	91	0.56
2min	80	81	0.71
3min	70	69	0.57
5min	63	67	0.25
1min after vasopressor-	109	82	0.0001

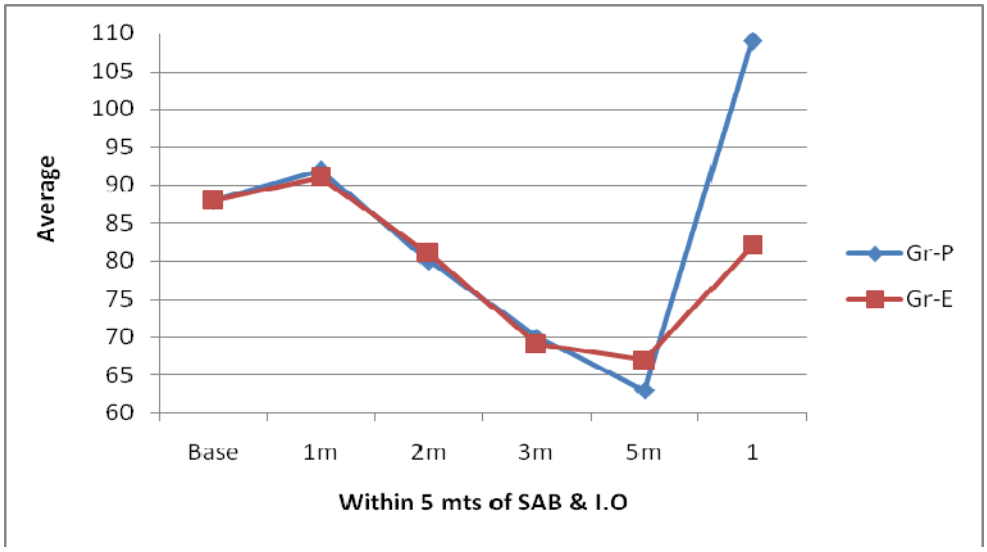


Table and Figure shows that **Within 5 minutes of SAB,** there is no significant difference between **Group-P** and **Group-E** on drop of average MAP at different minutes.

But after administering the drug, the '**P'** group shows very high average SBP compared to **Group-E which is statistically highly significant (p<0.0001).**

Distribution of average HR during Winthin 5 mts of SAB and 1st minute after giving vasopressor :

Time	Group-P	Group-E	P value
Baseline	79	80	0.6
1min	80	82	0.02
2min	81	83	0.27
3min	81	83	0.32
5min	79	82	0.2
1min after vasopressor	58	84	0.0001

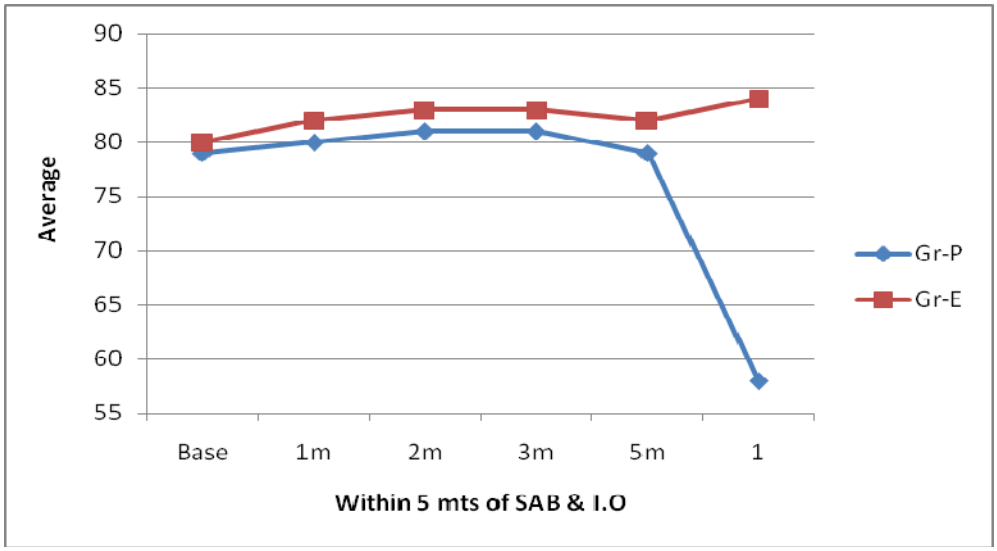


Table and Figure shows that **within 5 minutes of SAB**, there is no significant difference between **Group-P** and **Group-E** on average HR at different minutes.

But after administering the drug, the **'P'** group shows a fall in the heart rate compared to **Group-E which is statistically highly significant (p<0.0001).**

Distribution of SBP after giving Vasopressor Intraoperatively

Time in mins	Group-P	Group-E	P value
1	150	112	0.0001
2	145	113	0.0001
3	138	112	0.0001
5	128	114	0.0001
10	119	114	0.02
20	113	111	0.21
30	112	111	0.52
45	108	111	0.14
60	108	110	0.34

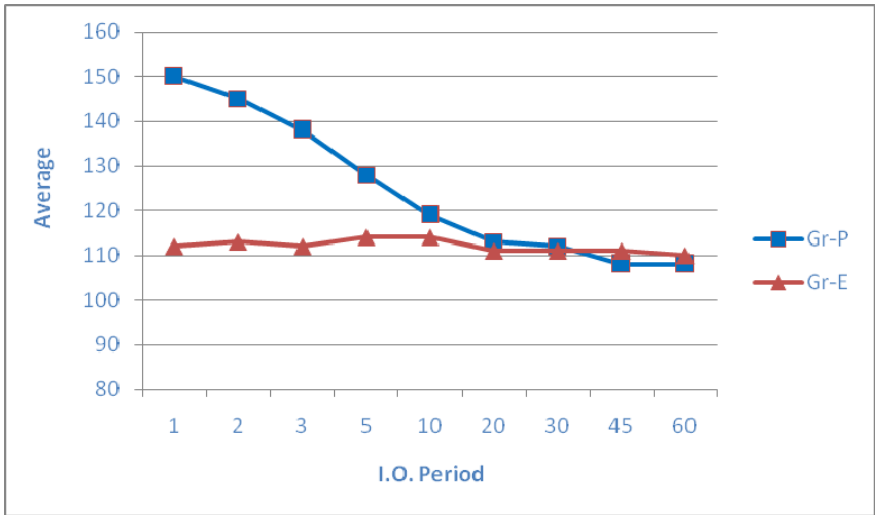


Table and figure reveals that there is significant difference of average SBP between two groups upto 5 minutes, after giving vasopressor but subsequently there is no significant difference. Average SBP at the first minute in **Group-P** and **Group-E** are 150mm Hg and 112 mm Hg respectively.

Distribution of DBP after giving Vasopressor Intraoperatively :

Time in mins	Group-P	Group-E	P value
1	90	71	0.0001
2	88	71	0.0001
3	85	71	0.0001
5	78	70	0.0001
10	75	71	0.03
20	73	71	0.16
30	72	71	0.48
45	70	72	0.14
60	68	71	0.30

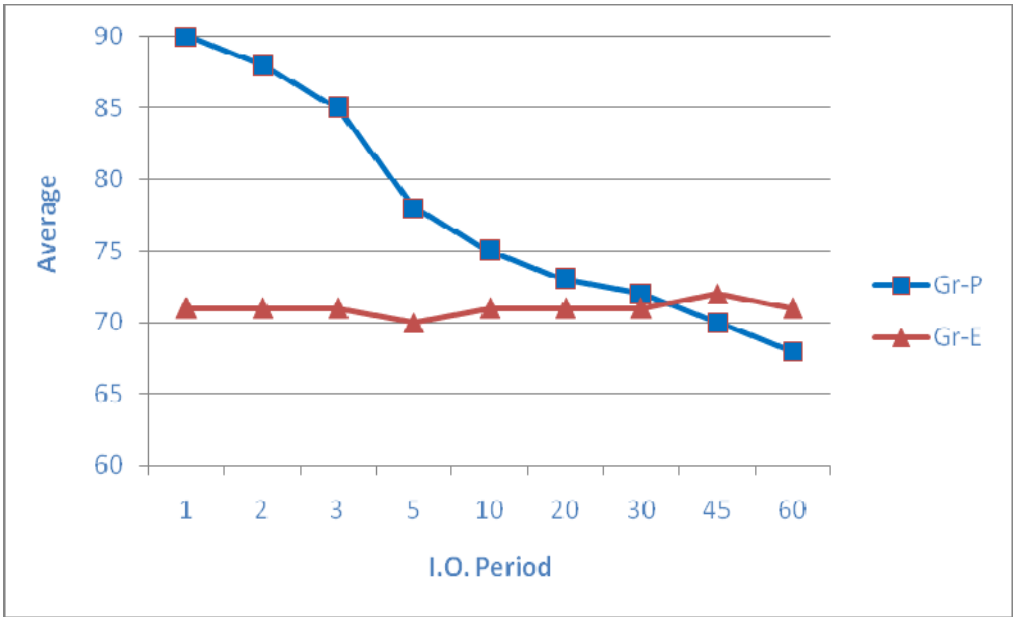


Table and figure reveals that there is significant difference of average DBP between two groups upto 5 minutes, after giving vasopressor but subsequently there is no significant difference. Average DBP at the first minute in **Group-P** and **Group-E** are 90mm Hg and 71mm Hg respectively.

Distribution of MAP after giving Vasopressor Intraoperatively :

Time in mins	Group-P	Group-E	P value
1	110	82	0.0001
2	106	83	0.0001
3	100	84	0.0001
5	91	84	0.0001
10	86	84	0.30
20	82	81	0.66
30	82	82	0.80
45	81	81	0.85
60	81	81	0.93

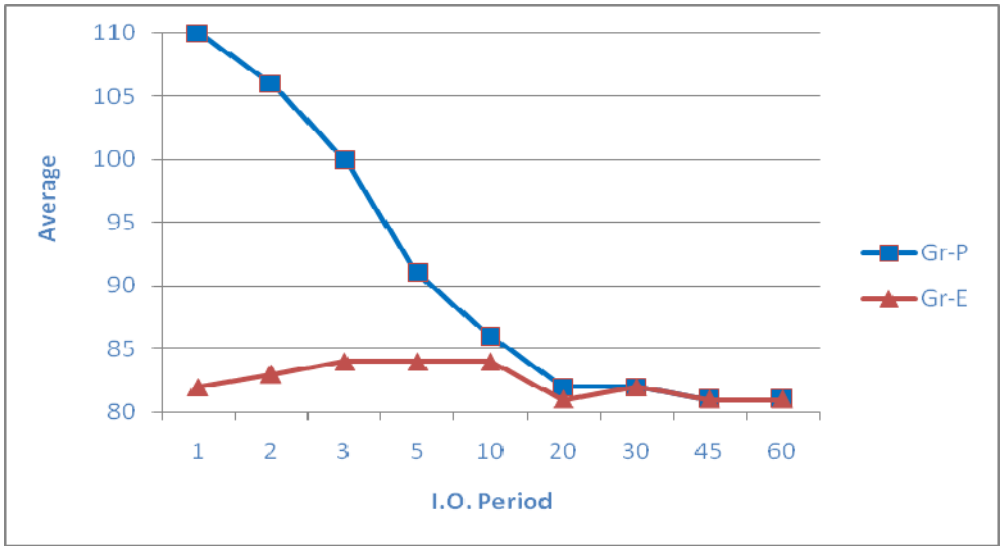


Table and figure reveals that there is significant difference of average MAP between two groups upto 5 minutes, after giving vasopressor but subsequently there is no significant difference. Average MAP at the first minute in **Group-P** and **Group-E** are 110mm Hg and 82 mm Hg respectively.

Distribution of HR after giving Vasopressor Intraoperatively :

Time in mins	Group-P	Group-E	P value
1	58	84	0.0001
2	58	85	0.0001
3	59	85	0.0001
5	64	84	0.0001
10	66	83	0.0001
20	71	83	0.0001
30	74	82	0.0001
45	75	81	0.0001
60	74	80	0.0041

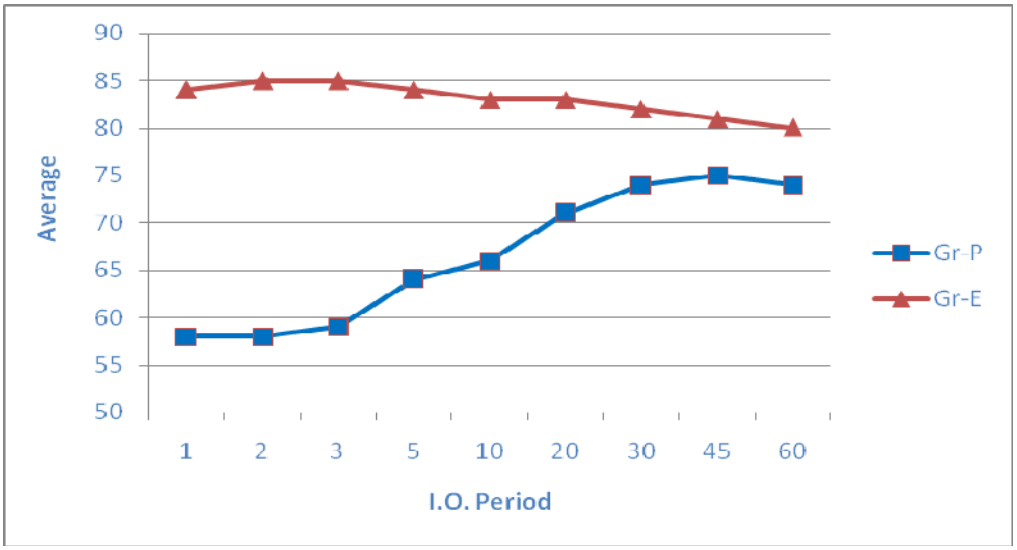


Table and figure reveals that there is significant difference of average HR between two groups throughout the intraoperative period. The heart rate of **Group-E** is always higher than the **Group-P** which is statistically significant.

POST-OP PERIOD

Distribution of SBP in the Post of Period

Time in mins	Group-P	Group-E	P value
30	112	114	0.52
60	114	116	0.12
90	115	116	0.35
130	115	115	0.94
150	120	116	0.094
180	119	117	0.28

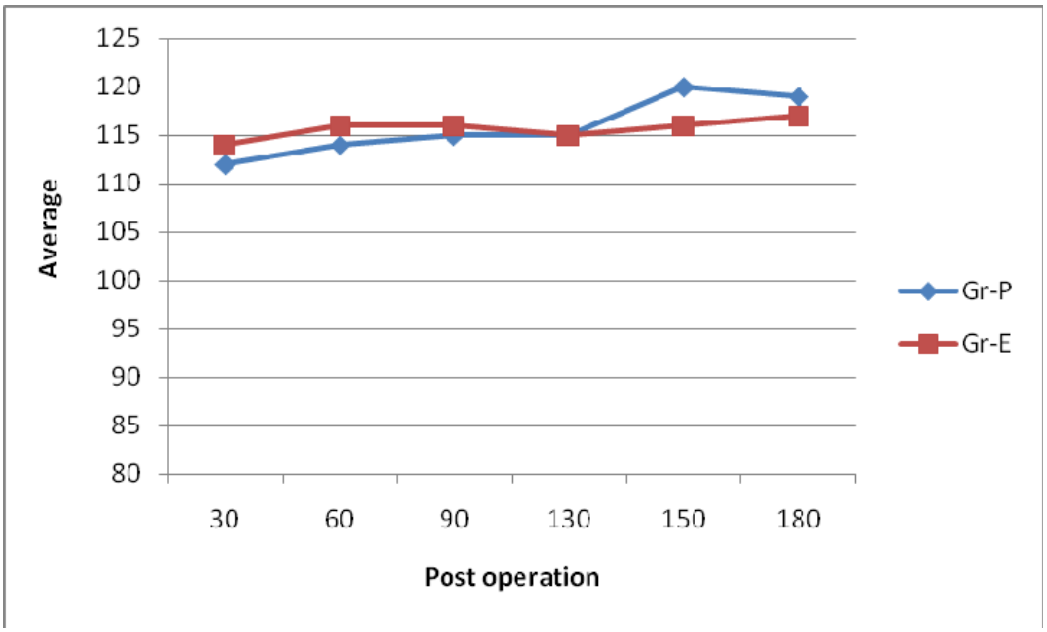


Table and figure reveals that there is no difference of average SBP at different time between two groups post operatively

Distribution of DBP in the Post of Period :

Time in mins	Gr-P	Gr-E	P value
30	71	74	0.09
60	72	73	0.52
90	74	73	0.90
130	75	74	0.71
150	74	73	0.82
180	76	75	0.39

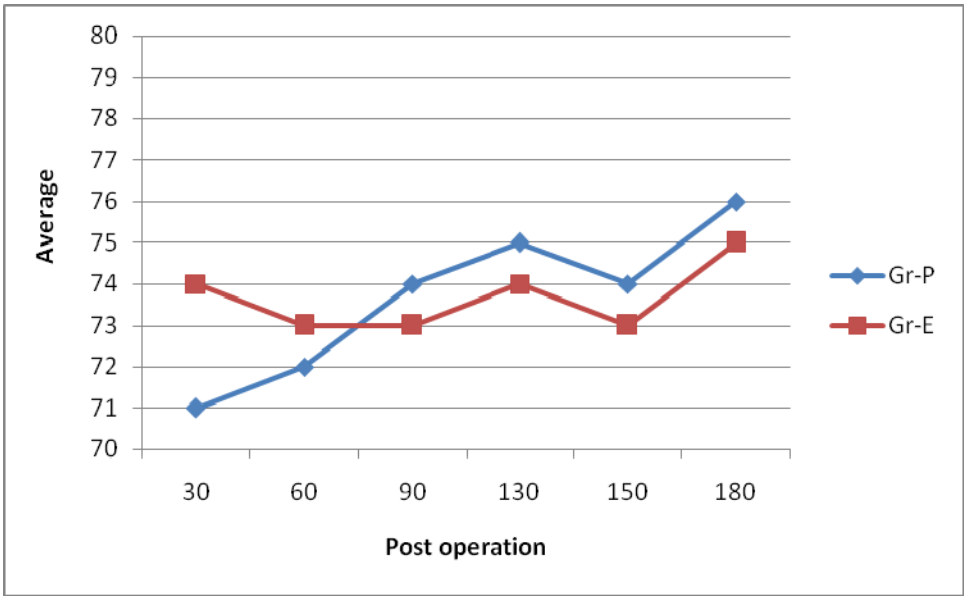


Table and figure reveals that there is no difference of average DBP at different time between two groups postoperatively.

Distribution of MAP in the Post of Period :

Time in mins	Group-P	Group-E	P value
30	83	84	0.49
60	85	85	0.73
90	85	85	0.94
130	85	86	0.83
150	87	86	0.69
180	88	88	0.77

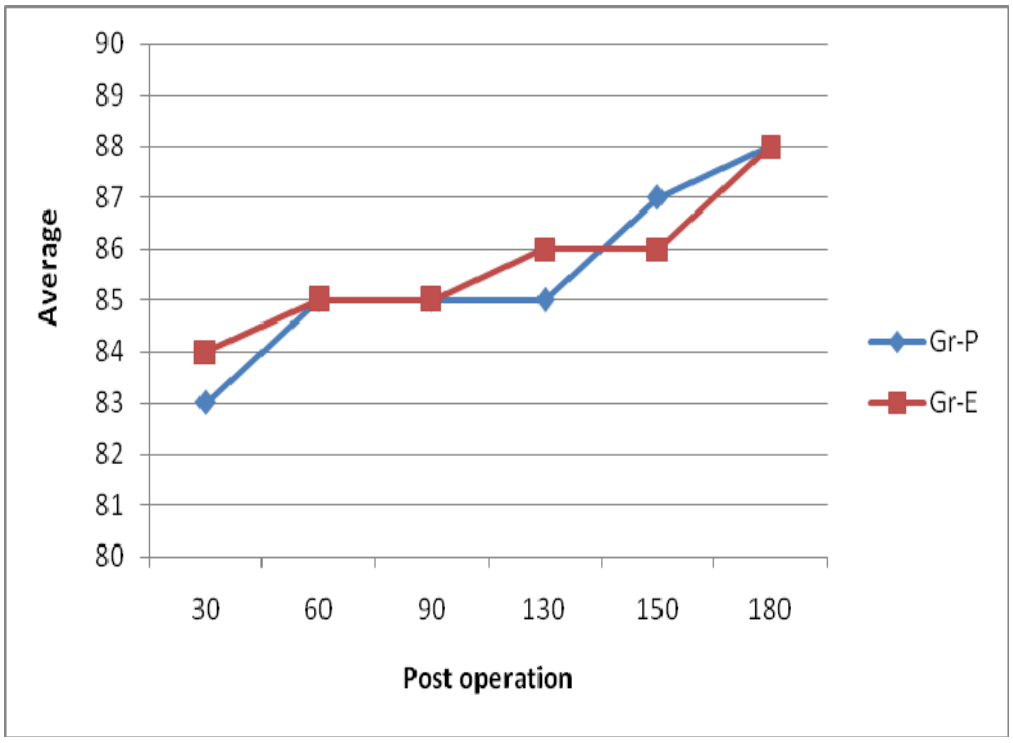


Table and figure reveals that there is no difference of average MAP at different time between two groups post operatively.

Distribution of HR in the Post of Period :

Time in mins	Group-P	Group-E	P value
30	80	82	0.15
60	80	82	0.12
90	80	81	0.13
130	80	82	0.09
150	80	81	0.20
180	80	82	0.09

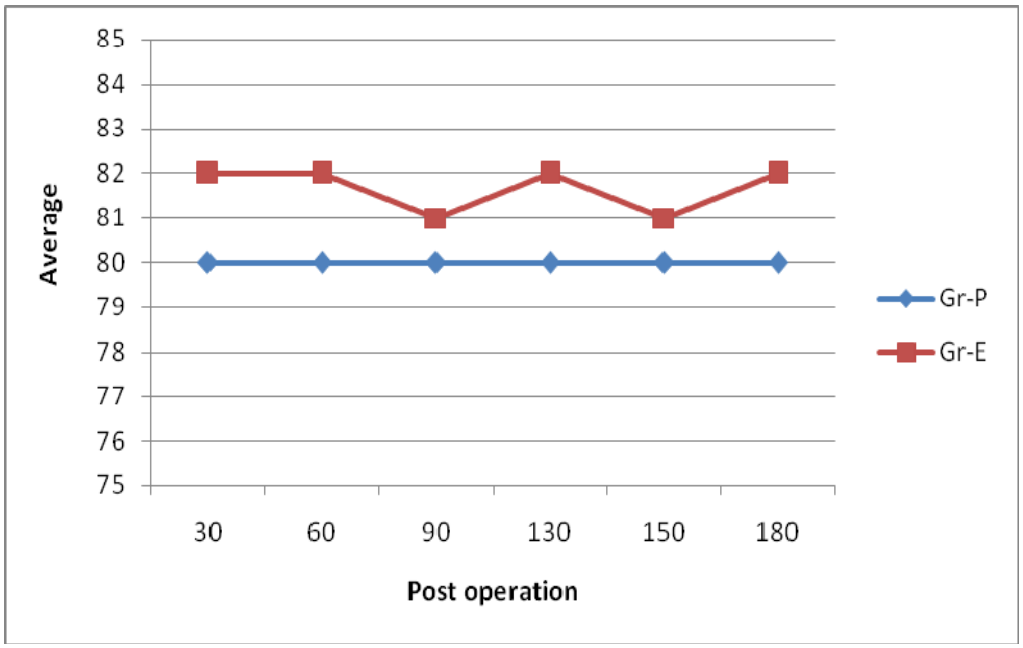


Table and figure reveals that there is no difference of average HR at different time between two groups postoperatively.

Side effects observed in two groups :

Side effects	GROUP-P	GROUP-E
HEADACHE	12	0

There was no serious side effects reported in **Group-E.**

Cost benefit :

Cost of one ampoule of inj. Phenylephrine : Rs. 198

Cost of One ampoule of inj. Ephedrine : Rs. 16

DISCUSSION

There are various studies on the use of inj.Phenylephrine hydrochloride in treating spinal hypotension in patients undergoing caeserean section. Use of inj.Phenylephrine hydrochloride was shown to produce an improvement in uterine perfusion and was considered as an advantage over inj. Ephedrine hydrochloride for the treatment of spinal hypotension. The cost of inj. Phenylephrine hydrochloride is around Rs.198 when compared to the cost of inj. Ephedrine hydrochloride which is around Rs.16.

Hence our study was aimed to compare inj. Phenylephrine hydrochloride and inj. Ephedrine hydrochloride in non obstetric surgeries where the advantage for maintaining uterine perfusion remains irrelevant.

In our study inguinal hernia and lower limb orthopedic sugeries were performed under spinal anaesthesia. We used vasopressors inj.Phenyl ephrine hydrochloride (**Group P**) or inj.Ephedrine hydrochloride (**Group E**) to treat spinal hypotension whenever systolic blood pressure dropped to a level 30% below the baseline value. We found that when inj. Phenylephrine hydrochloride was used there was a statistically highly significant ($p<0.0001$) rise in systolic blood pressure within one minute which corresponds to the study done by Dinesh et al[9] and Niranjan Maitra et al [10] .

In our study we also noticed a rise in systolic blood pressure following inj.Phenylephrine hydrochloride which was associated with headache which persisted till the systolic blood pressure settled after 5 minutes. The systolic blood pressure settled to a more constant value with disappearance of headache which suggests that the headache could have been due to sudden surge of systolic blood pressure within 1 minute.

When using inj.Ephedrine hydrochloride in our study the systolic blood pressure started rising after 2 to5 minutes to an average of 112mm Hg when compared to 150 mm Hg in the inj. Phenylephrine hydrochloride group which were similar to the studies done by Dinesh et al[9]. There was no incidence of headache with the onset of rise in systolic blood pressure in inj.Ephedrine hydrochloride group.

The rise in diastolic blood pressure in **Group P** were also statistically highly significant ($p<0.0001$) within one minute, and settled after 10 minutes, which was similar to the studies done by Brooker et al[2].

In inj.Ephedrine hydrochloride group the rise in diastolic blood pressure within 1 minute was 71 mm Hg in an average when compared to an average of 90 mm Hg in inj. Phenylephrine hydrochloride group.

Similarly, statistically highly significant rise in mean arterial pressure with inj.Phenylephrine hydrochloride group which was

109mm Hg in an average was noticed when compared to an average of 82mm Hg in inj. Ephedrine hydrochloride group.

In our study there was highly statistically significant ($p<0.0001$) drop in the heart rate in inj. Phenylephrine hydrochloride group during the first five minutes. This drop in the heart rate could be due to the baroreceptor stimuli which gets activated due to increased systemic vascular resistance and mean arterial pressure. Hence the drop in the heart rate which lasted for five minutes did not require any treatment as shown by studies of Brooker et al[2] .

In inj. Ephedrine hydrochloride group there was statistically no significant change in heart rate as compared to inj.Phenylephrine hydrochloride group as per the studies of Cooper David et al[7] and there was no incidence of supra ventricular tachycardia as per Nirajan Maitra et al[10] studies.

The phenomenon of tachyphylaxis as per the studies of Paul cly burn[4]was not met with, in our study since we have not repeated the dose of inj. Ephedrine hydrochloride.

There was statistically significant incidence of transient headache in inj. Phenylephrine hydrochloride group which was not found in inj.Ephedrine hydrochloride group.

There was no statistically significant incidence of nausea and vomiting in both the groups which deferred from the study of Ednomagal

haes et al[11] who met with the incidence of nausea and vomiting for **Group P** (10 and 6) and for **Group E** (7 and 4).This difference may be due to limited number of cases in our study.

POST OPERATIVE PERIOD

There was no statistical difference of average systolic blood pressure, diastolic blood pressure, mean arterial pressure and heart rate at different time intervals between two groups post operatively .

CONCLUSION

One of the commonest complications met with sub arachnoid block is spinal hypotension. Various studies have been done on patients undergoing caeserean section using inj. Phenylephrine hydrochloride for the treatment of spinal hypotension. Inj. Ephedrine hydrochloride is conventionally being used for treating spinal hypotension. This has led to our study in comparing inj.Ephedrine hydrochloride with inj.Phenylephrine hydrochloride in treating spinal hypotension in non – obstetrics surgeries.

In our study we found that inj.Phenylephrine hydrochloride produced high rise in systolic blood pressure associated with headache. A high rise in diastolic blood pressure and mean arterial pressure was also noticed. With inj. Phenylephrine hydrochloride there was significant fall in heart rate which was not seen in patients treated with inj. Ephedrine hydrochloride.

Comparing the hemodynamic effects of inj. Ephedrine and inj. Phenylephrine groups we conclude that the treatment of spinal hypotension with **inj. Ephedrine hydrochloride** has lesser fluctuations in hemodynamic variables and is also cost – effective and may be considered as a better choice of vasopressor for treating spinal hypotension in non-obstetric surgeries.

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PROFORMA

Name: Age/Sex IP No. Weight kgs

Height in cms

Diagnosis: Surgery :

Pre OP Assessment :

Investigations : O/E

Premedication :

Preloading :

Positioning :

Needle type :

Level of dural puncture :

Volume of drug :

Sensory level achieved :

1 min	3 min	5 min	10 min

INTRA OP

	1min	2min	3min	5min	1min	3min	5min	10min	20min	30min	45min	60min	End of surgery	Sensory level at end of Surgery
SBP														
DBP														
MAP														
HR														
SPO2														
P100µg E6mg														

POST OP

	30 min	60 min	90min	130 min	150 min	180 min
SBP						
DBP						
MAP						
HR						
SPO2						
SENSORY LEVEL						

DATA OF PATIENTS 1 - 25 (GROUP - P)

SL. No	NAME	AGE	SEX	WT IN KG	HT IN CM	SENSORY LEVEL ACHIEVED				BASE LINE VALUES				
						1 MIN	3MIN	5MIN	10 MIN	SBP	DBP	MAP	HR	SPO2
1	SHANKAR	35	M	60	154	T10	T8	T6	T6	130	80	96	84	100%
2	DINAKARAN	35	M	45	150	T10	T8	T7	T6	110	80	90	82	100%
3	KRIBANITHI	35	F	51	152	T10	T8	T6	T6	110	80	90	80	100%
4	KATHAVARAYAN	50	M	50	153	T10	T8	T7	T6	140	90	106	80	100%
5	ABDUL	42	M	45	149	T12	T11	T10	T6	120	80	93	80	100%
6	KRISHNAN	50	M	54	150	T10	T10	T8	T6	130	80	96	80	100%
7	NETHAN	50	M	70	150	T10	T10	T8	T6	110	80	90	80	100%
8	KANNAN	47	M	42	155	T11	T11	T10	T6	130	80	96	84	100%
9	DAVID	29	M	88	152	T11	T10	T7	T7	120	70	86	84	100%
10	SARAVANAN	28	M	45	156	T10	T8	T6	T6	100	70	80	80	100%
11	RAJI	35	M	50	151	T10	T10	T7	T6	132	92	105	80	100%
12	SURESH	28	M	48	148	T10	T8	T6	T6	110	70	83	80	100%
13	UDHAYAKUMAR	25	M	32	150	T10	T8	T7	T6	120	80	93	80	100%
14	ANBURAJ	26	M	37	152	T10	T10	T7	T6	110	70	83	80	100%
15	MURUGAN	27	M	25	158	T10	T8	T8	T6	110	70	83	80	100%
16	ARJUNAN	50	M	50	157	T10	T10	T8	T7	130	80	96	80	100%
17	PANNEERSELVAM	20	M	25	159	T10	T10	T8	T6	120	80	93	80	100%
18	KASIRAJ	35	M	45	149	T10	T10	T7	T6	110	70	83	80	100%
19	PERUMAL	50	M	48	158	T10	T10	T7	T6	120	70	86	80	100%
20	SHANKAR	35	M	43	150	T12	T11	T10	T7	110	70	83	84	100%
21	KASI	45	M	50	159	T10	T8	T7	T6	110	80	90	80	100%
22	GUNASEKARAN	20	M	28	156	T10	T8	T6	T6	130	70	90	80	100%
23	MANIKANDAN	20	M	36	148	T10	T10	T7	T6	120	70	86	80	100%
24	THULUKANAM	45	M	48	156	T10	T10	T8	T6	120	80	93	80	100%
25	VENKATESAN	45	M	45	147	T10	T8	T8	T6	110	70	83	80	100%

INTRA OP - PERIOD

1 MINUTE						2 MINUTE					3 MINUTE				
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**
1.	128	62	84	83	100%	110	60	76	80	100%	98	55	69	74	100%
2.	122	82	95	70	100%	120	80	93	80	100%	80	60	60	85	100%
3.	120	80	93	65	100%	120	80	93	80	100%	100	70	80	85	100%
4.	140	90	106	86	100%	130	70	90	85	100%	90	60	70	80	100%
5.	127	90	109	80	100%	127	90	109	84	100%	88	54	65	87	100%
6.	100	70	80	74	100%	102	70	81	76	100%	100	60	73	78	100%
7.	140	90	106	64	99%	130	60	83	68	99%	80	60	66	65	100%
8.	140	90	106	80	100%	118	75	86	84	100%	110	76	85	88	100%
9.	125	80	97	80	100%	118	75	86	84	100%	90	60	70	80	100%
10.	140	90	106	80	100%	110	76	85	88	100%	90	60	70	90	100%
11.	132	93	78	70	100%	110	60	70	72	100%	90	60	70	80	100%
12.	130	68	88	80	100%	140	90	106	81	100%	90	60	70	82	100%
13.	130	68	88	80	100%	121	78	90	85	100%	90	60	70	84	100%
14.	132	93	78	84	100%	121	80	69	75	100%	90	60	70	80	100%
15.	130	80	96	85	100%	80	53	62	80	100%	0	0	0	0	0
16.	130	80	96	86	100%	124	70	88	85	100%	110	60	76	82	100
17.	110	70	83	85	100%	112	80	90	80	100%	90	60	70	89	100%
18.	124	80	94	80	100%	100	60	73	82	100%	90	60	70	84	100%
19.	127	90	109	85	100%	88	54	65	80	100%	0	0	0	0	0%
20.	127	90	109	84	100%	110	70	84	84	100%	88	54	65	80	100%
21.	110	70	83	81	100%	100	62	74	80	100%	80	60	66	79	100%
22.	100	60	73	70	100%	100	62	74	84	100%	110	70	83	85	100%
23.	100	60	73	82	100%	100	62	74	81	100%	90	54	66	80	100%
24.	122	72	88	85	100%	98	60	72	88	100%	90	52	64	89	100%
25.	110	72	84	84	100%	105	80	88	80	100%	100	70	80	80	100%

INTRA OP - PERIOD

5 MINUTE						1 MINUTE					2 MINUTE				
S.No.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
1.	0	0	0	0	0	150	90	110	60	100%	140	90	106	62	100%
2.	0	0	0	0	0	150	100	116	59	100%	140	100	113	55	100%
3.	80	60	66	80	100%	150	100	116	60	100%	140	100	113	62	100%
4.	0	0	0	0	0	170	80	110	55	100%	172	82	112	56	100%
5.	0	0	0	0	0	110	70	84	67	100%	106	68	79	68	100%
6.	90	50	63	70	100%	150	90	110	56	100%	140	90	106	55	100%
7.	0	0	0	0	0	150	90	110	50	100%	150	92	114	52	100%
8.	90	60	70	80	100%	125	97	108	49	100%	164	97	115	46	100%
9.	0	0	0	0	0	140	90	106	50	100%	164	97	115	49	100%
10.	0	0	0	0	0	164	97	115	50	100%	147	90	104	62	100%
11.	0	0	0	0	0	127	90	75	60	100%	132	93	78	58	100%
12.	0	0	0	0	0	164	97	115	56	100%	151	90	110	59	100%
13.	0	0	0	0	0	164	97	115	57	100%	151	90	110	59	100%
14.	0	0	0	0	0	140	90	113	60	100%	148	70	96	56	100%
15.	0	0	0	0	0	164	100	121	54	100%	151	95	115	55	100%
16.	80	53	36	80	100%	160	90	113	55	100%	157	90	112	52	100%
17.	0	0	0	0	0	164	100	121	60	100%	157	95	115	59	100%
18.	0	0	0	0	0	157	90	112	53	100%	157	95	115	59	100%
19.	0	0	0	0	0	120	70	88	79	100%	110	70	84	56	100%
20.	0	0	0	0	0	120	70	88	59	100%	110	70	84	55	100%
21.	0	0	0	0	0	150	90	120	60	100%	126	86	98	59	100%
22.	80	50	60	82	100%	150	90	120	55	100%	126	84	98	56	100%
23.	0	0	0	0	0	150	90	120	57	100%	157	90	115	60	100%
24.	0	0	0	0	0	154	100	118	54	100%	144	92	109	55	100%
25.	90	62	71	81	100%	160	100	120	56	100%	152	104	120	58	100%

INTRA OP - PERIOD

3 MINUTE						5 MINUTE					10 MINUTE				
S.No.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
1.	110	70	83	60	100%	110	70	83	61	100%	110	72	84	65	100%
2.	144	110	121	65	100%	130	90	103	65	100%	130	92	105	64	100%
3.	144	110	121	60	100%	130	90	103	65	100%	130	90	103	70	100%
4.	160	90	113	60	100%	130	70	90	66	100%	120	70	86	68	100%
5.	110	70	84	70	100%	100	70	80	75	100%	110	70	84	76	100%
6.	130	80	96	60	100%	130	80	96	61	100%	140	90	100	60	100%
7.	140	70	86	55	100%	134	76	95	55	98%	130	70	90	54	100%
8.	147	90	104	62	100%	125	86	97	70	100%	121	78	90	61	100%
9.	147	90	104	62	100%	130	90	109	70	100%	121	78	90	61	100%
10.	140	90	106	60	100%	121	78	90	61	100%	118	75	86	60	100%
11.	147	90	104	62	100%	129	89	74	62	100%	123	89	75	62	100%
12.	140	90	100	60	100%	140	80	100	65	100%	121	78	90	70	100%
13.	140	80	100	60	100%	140	90	106	65	100%	118	75	100	66	100%
14.	129	89	74	55	100%	125	90	73	56	100%	123	87	69	58	100%
15.	160	90	113	56	100%	152	94	113	60	100%	130	68	88	65	100%
16.	136	70	92	48	100%	100	60	73	89	100%	108	70	82	90	100%
17.	136	70	66	62	100%	124	80	44	64	100%	110	80	90	60	100%
18.	136	70	92	60	100%	148	52	84	65	100%	130	68	88	75	100%
19.	130	90	103	58	100%	120	70	88	60	100%	124	72	89	71	100%
20.	106	68	79	52	100%	110	70	84	60	100%	120	70	88	61	100%
21.	150	90	120	61	100%	130	70	100	64	100%	100	60	73	65	100%
22.	150	90	100	56	100%	130	72	107	60	100%	130	70	100	62	100%
23.	130	72	107	65	100%	130	70	100	60	100%	100	62	74	61	100%
24.	138	94	108	65	100%	127	70	89	72	100%	120	71	87	75	100%
25.	138	90	106	59	100%	140	74	96	70	100%	110	72	84	74	100%

INTRA OP - PERIOD

20 MINUTE						30 MINUTE					45 MINUTE					60 MINUTE				
S.No.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
1.	112	70	84	70	100%	110	70	83	74	100%	100	72	81	72	100%	118	65	82	70	100%
2.	110	80	90	70	100%	110	70	83	71	100%	112	72	85	74	100%	110	70	83	75	100%
3.	110	80	90	72	100%	110	70	83	72	100%	112	72	85	74	100%	0	0	0	0	0
4.	120	70	86	70	100%	100	70	33	71	100%	110	60	76	72	100%	110	60	76	70	100%
5.	98	60	72	78	100%	120	70	88	78	100%	110	70	84	78	100%	110	60	84	72	100%
6.	110	80	90	75	100%	130	80	96	75	100%	110	80	90	70	100%	0	0	0	0	0
7.	110	60	76	60	100%	116	69	84	62	100%	100	70	80	64	100%	110	80	90	65	100%
8.	118	77	87	80	100%	119	80	92	62	100%	116	78	90	68	100%	0	0	0	0	0
9.	118	77	87	80	100%	119	80	92	76	100%	116	78	90	68	100%	0	0	0	0	0
10.	118	77	87	62	100%	119	80	92	60	100%	116	78	90	68	100%	0	0	0	0	0
11.	125	90	73	61	100%	123	87	69	65	100%	121	86	69	64	100%	0	0	0	0	0
12.	118	75	80	71	100%	119	80	92	72	100%	100	60	73	74	100%	116	78	90	70	100%
13.	119	80	92	70	100%	100	60	73	75	100%	116	78	90	79	100%	0	0	0	0	0
14.	127	90	75	60	100%	120	80	93	70	100%	118	72	87	71	100%	0	0	0	0	0
15.	110	70	83	70	100%	110	70	83	75	100%	100	60	73	80	100%	0	0	0	0	0
16.	111	60	77	88	100%	114	62	79	85	100%	109	60	76	86	100%	0	0	0	0	0
17.	110	82	91	61	100%	114	62	79	72	100%	110	70	83	79	100%	110	70	83	75	100%
18.	112	80	90	80	100%	110	70	83	84	100%	100	60	70	85	100%	110	70	83	80	100%
19.	124	80	94	75	100%	110	80	90	72	100%	120	70	88	74	100%	0	0	0	0	0
20.	124	72	89	65	100%	106	70	82	70	100%	100	60	73	72	100%	120	70	88	70	100%
21.	104	60	74	60	100%	100	60	73	69	100%	100	62	74	70	100%	0	0	0	0	0
22.	110	60	70	60	100%	104	60	74	64	100%	100	60	73	60	100%	100	60	73	65	100%
23.	100	60	73	68	100%	100	60	73	69	100%	104	60	74	70	100%	0	0	0	0	0
24.	119	72	87	78	100%	110	60	74	81	100%	110	72	84	84	100%	100	78	85	85	100%
25.	102	60	74	75	100%	100	72	81	80	100%	100	70	80	81	100%	0	0	0	0	0

POST OP PERIOD

30 MINUTE							60 MINUTE					
S.No.	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
1.	100	70	81	80	100%	T10	110	80	90	82	100%	T10
2.	110	60	76	84	100%	T9	120	70	80	82	100%	T10
3.	100	70	87	84	100%	T10	110	80	90	82	100%	T10
4.	110	60	76	86	100%	T9	126	70	88	83	100%	T10
5.	100	70	80	75	100%	T10	110	70	84	76	100%	T10
6.	120	70	88	73	100%	T10	120	70	88	70	100%	T10
7.	100	70	81	84	100%	T10	100	70	81	83	100%	T10
8.	113	66	77	75	100%	T8	110	68	84	77	100%	T18
9.	110	60	78	86	100%	T8	120	70	88	83	100%	T9
10.	120	83	67	70	100%	T8	110	68	84	77	100%	T10
11.	120	83	67	70	100%	T8	129	89	74	72	100%	T10
12.	115	73	87	74	100%	T8	116	60	78	70	100%	T10
13.	110	68	84	70	100%	T8	115	73	87	74	100%	T8
14.	121	86	69	76	100%	T8	120	83	67	76	100%	T10
15.	112	80	90	84	100%	T10	114	62	79	80	100%	T10
16.	110	60	76	84	100%	T8	124	76	92	85	100%	T10
17.	104	60	74	72	100%	T10	100	60	73	72	100%	T10
18.	110	70	83	84	100%	T10	114	62	79	80	100%	T10
19.	120	80	93	84	100%	T8	114	80	91	78	100%	T10
20.	112	72	85	70	100%	T10	106	68	79	72	100%	T11
21.	120	80	93	84	100%	T10	100	62	74	80	100%	T10
22.	110	70	83	80	100%	T10	120	80	93	81	100%	T10
23.	100	62	74	72	100%	T10	112	80	90	74	100%	T10
24.	110	72	84	84	100%	T8	125	70	88	86	100%	T10
25.	120	72	88	84	100%	L1	122	72	88	86	100%	T10

POST OP PERIOD

90 MINUTE							130 MINUTE					
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
1.	110	80	90	84	100%	T11	110	80	90	83	100%	T12
2.	122	72	88	84	100%	T10	126	70	88	80	100%	T11
3.	110	80	90	84	100%	T11	110	80	90	83	100%	T11
4.	120	70	86	82	100%	T10	130	80	96	72	100%	T11
5.	112	72	85	74	100%	T11	114	80	91	78	100%	T11
6.	110	80	90	84	100%	T11	120	80	93	86	100%	T12
7.	120	84	96	84	100%	T11	124	84	97	82	100%	T12
8.	116	78	90	70	100%	T10	115	73	87	72	100%	T10
9.	120	70	88	84	100%	T9	100	70	80	85	100%	T10
10.	121	86	69	70	100%	T10	115	73	87	72	100%	T12
11.	118	82	68	74	100%	T10	121	86	69	70	100%	T12
12.	110	68	84	77	100%	T11	120	83	67	70	100%	T11
13.	116	60	78	70	100%	T10	120	83	67	72	100%	T12
14.	129	89	74	72	100%	T11	118	82	68	74	100%	T11
15.	110	80	90	84	100%	T11	120	80	93	80	100%	T11
16.	110	80	90	80	100%	T10	124	80	94	79	100%	T11
17.	126	84	98	74	100%	T11	110	72	84	74	100%	T11
18.	112	80	90	80	100%	T12	110	72	84	79	100%	T12
19.	112	72	85	74	100%	T10	120	80	93	75	100%	T11
20.	114	80	91	78	100%	T11	100	70	80	75	100%	T12
21.	100	60	73	80	100%	T11	126	84	98	85	100%	T11
22.	110	80	90	79	100%	T11	120	80	93	70	100%	T11
23.	110	70	84	70	100%	T11	114	62	79	74	100%	T12
24.	100	60	72	84	100%	T10	120	74	89	85	100%	T11
25.	110	74	86	87	100%	T10	108	72	84	80	100%	T11

POST OP PERIOD

150 MINUTE							180 MINUTE						
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SIDE EFFECTS**
1.	120	80	93	84	100%	T12	120	80	93	84	100%	T12	
2.	130	80	96	79	100%	T11	130	80	96	80	100%	T12	
3.	120	80	93	84	100%	T12	120	80	93	84	100%	L1	
4.	126	70	88	84	100%	T11	130	80	96	74	100%	T12	Headache
5.	120	80	93	80	100%	T12	120	80	93	80	100%	L1	
6.	100	70	80	74	100%	T12	120	80	93	75	100%	L1	
7.	131	62	85	80	100%	T12	140	90	106	86	100%	L1	
8.	133	85	104	74	100%	T11	125	77	96	78	100%	T12	
9.	110	70	83	80	100%	T10	110	70	83	80	100%	T11	
10.	133	85	104	74	100%	T12	127	90	78	72	100%	L1	Headache
11.	127	90	78	72	100%	T12	127	90	78	72	100%	L1	
12.	121	86	69	70	100%	T12	120	83	67	74	100%	L1	Headache
13.	121	86	69	75	100%	T12	120	83	67	74	100%	L1	Headache
14.	121	86	69	70	100%	T12	120	80	93	76	100%	L1	
15.	124	70	88	80	100%	T12	120	80	93	82	100%	L1	Headache
16.	136	70	92	78	100%	T12	120	76	90	80	100%	T12	Headache
17.	110	70	83	76	100%	T12	120	80	93	70	100%	L1	Headache
18.	110	82	91	78	100%	C1	126	84	98	74	100%	L1	
19.	124	72	89	76	100%	T11	120	80	93	80	100%	T12	
20.	120	80	93	80	100%	T12	120	70	88	81	100%	L1	
21.	110	70	83	84	100%	T12	120	80	93	85	100%	L1	
22.	120	80	93	84	100%	T12	120	80	93	84	100%	L1	
23.	100	60	73	70	100%	T12	110	70	83	80	100%	L1	
24.	110	60	76	84	100%	T12	110	72	84	85	100%	L1	
25.	112	74	86	82	100%	T12	100	72	81	82	100%	L1	Headache

DATA OF PATIENTS 26 - 50 (GROUP - P)

SL. No	NAME	AGE	SEX	WT IN KG	HT IN CM	SENSORY LEVEL ACHIEVED				BASE LINE VALUES				
						1 MIN	3MIN	5MIN	10 MIN	SBP	DBP	MAP	HR	SPO2
26.	KASI	40	M	45	153	T8	T8	T7	T6	110	70	83	80	100%
27.	ARULMANI	38	M	47	153	T10	T8	T7	T6	130	80	96	80	100%
28.	LOGANATHAN	30	M	45	155	T11	T11	T10	T8	110	70	83	84	100%
29.	SUKUMAR	47	M	65	154	T10	T7	T6	T5	0	0	0	0	0%
30.	ILAVARASAN	23	M	50	156	T10	T8	T6	T6	120	80	93	80	100%
31.	MUTHU	45	M	51	157	T11	T11	T10	T7	130	80	96	80	100%
32.	BALARAMAN	45	M	40	158	T10	T8	T8	T7	120	70	86	80	100%
33.	ARULMANI	38	M	45	156	T11	T11	T10	T7	120	60	80	80	100%
34.	UMA	20	F	31	155	T11	T10	T8	T6	120	60	80	82	100%
35.	EGAMBARAM	29	M	50	145	T11	T11	T10	T6	110	60	76	72	100%
36.	MANIKANDAN	20	M	28	154	T10	T8	T7	T6	120	70	86	90	100%
37.	THANGARAJ	40	M	48	158	T10	T8	T6	T6	110	70	86	80	100%
38.	DEVENDIRAN	32	M	51	156	T11	T10	T7	T7	140	90	106	84	100%
39.	KUPPUSAMY	43	M	45	160	T10	T10	T7	T6	120	70	86	84	100%
40.	SENTHIL	26	M	32	154	T10	T10	T7	T6	110	80	90	80	100%
41.	SUBRAMANI	50	M	48	156	T10	T10	T8	T6	130	80	96	80	100%
42.	DHINAKARAN	40	M	35	158	T10	T8	T6	T6	110	70	86	80	100%
43.	MUNUSAMY	21	M	32	149	T8	T7	T6	T6	130	82	98	80	100%
44.	IYYAPPAN	27	M	40	155	T10	T8	T7	T6	140	90	106	90	100%
45.	VENKATESAN	21	M	56	158	T10	T10	T8	T7	110	70	83	84	100%
46.	SARAVANAN	25	M	49	156	T10	T8	T7	T6	130	80	96	80	100%
47.	KUPPUSAMY	43	M	49	157	T10	T8	T6	T6	100	70	80	80	100%
48.	NAGAPAN	50	M	60	151	T10	T8	T7	T6	110	70	83	80	100%
49.	RAJENDIRAN	50	M	52	154	T10	T8	T8	T7	120	70	86	80	100%
50.	PRAKASH	26	M	32	157	T10	T8	T7	T6	110	80	90	80	100%

INTRA OP - PERIOD

1 MINUTE						2 MINUTE					3 MINUTE				
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**
26.	116	76	89	84	100%	100	60	73	85	100%	78	56	63	86	100%
27.	130	72	91	84	100%	110	60	76	86	100%	100	60	73	86	100%
28.	140	70	133	85	100%	80	50	60	60	100%	0	0	0	0	0
29.	130	90	103	70	100%	94	67	54	70	99%	0	0	0	0	0
30.	100	70	80	74	100%	102	70	81	76	100%	100	60	73	76	100%
31.	140	90	106	82	100%	110	76	85	84	100%	105	69	81	84	100%
32.	110	60	76	80	100%	110	60	76	82	100%	100	70	33	84	100%
33.	130	68	88	83	100%	80	50	60	84	100%	0	0	0	0	0
34.	130	90	109	80	100%	90	50	63	84	100%	0	0	0	0	0
35.	130	68	88	80	100%	110	70	83	75	100%	90	60	70	74	100%
36.	130	88	102	84	100%	98	55	69	86	100%	0	0	0	0	0
37.	100	70	80	72	100%	112	72	85	74	100%	104	62	76	80	100%
38.	110	60	76	78	100%	114	78	90	80	100%	110	60	73	84	100%
39.	120	80	93	78	100%	130	70	90	80	100%	90	60	70	84	100%
40.	128	70	89	80	100%	116	69	94	82	100%	80	60	66	79	100%
41.	130	80	96	74	100%	130	80	96	78	100%	90	50	63	79	100%
42.	110	70	83	84	100%	110	70	83	70	100%	100	60	73	70	100%
43.	112	80	90	79	100%	100	60	73	80	100%	90	60	80	84	100%
44.	120	80	93	85	100%	110	70	83	86	100%	90	50	63	80	100%
45.	112	72	85	80	100%	98	70	79	88	100%	80	60	66	90	100%
46.	130	82	98	84	100%	100	72	81	83	100%	99	56	68	86	100%
47.	120	70	86	84	100%	104	64	77	83	100%	98	70	79	80	100%
48.	128	70	89	80	100%	110	60	78	82	100%	100	72	81	70	100%
49.	128	78	94	84	100%	102	60	74	85	100%	90	50	63	70	100%
50.	110	70	83	81	100%	100	62	74	80	100%	80	60	66	79	100%

INTRA OP - PERIOD

5 MINUTE						1 MINUTE					2 MINUTE				
S.No	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	0	0	0	0	0	150	70	96	60	100%	138	72	94	65	100%
27.	90	50	63	87	100%	159	70	99	56	100%	150	62	91	59	100%
28.	0	0	0	0	0	150	90	110	57	100%	140	90	106	70	100%
29.	0	0	0	0	0	104	81	67	68	99%	121	88	74	75	100%
30.	90	50	63	70	100%	150	90	110	56	100%	140	90	106	55	100%
31.	90	60	70	81	100%	164	97	115	60	100%	147	90	104	64	100%
32.	80	60	66	82	100%	160	90	113	70	100%	160	90	113	64	100%
33.	0	0	0	0	0%	150	90	110	56	100%	150	92	111	57	100%
34.	0	0	0	0	0%	164	97	115	80	100%	160	90	113	51	100%
35.	0	0	0	0	0%	160	92	114	55	100%	151	90	110	52	100%
36.	0	0	0	0	0%	160	100	120	78	100%	150	90	110	60	100%
37.	80	60	66	75	100%	150	100	116	60	100%	160	90	113	59	100%
38.	80	50	60	80	100%	157	95	115	56	100%	150	100	116	58	100%
39.	0	0	0	0	0%	160	90	113	54	100%	150	100	116	55	100%
40.	0	0	0	0	0%	150	92	114	55	100%	150	100	116	52	100%
41.	0	0	0	0	0%	150	90	110	55	100%	150	100	116	56	100%
42.	80	50	60	85	100%	126	84	98	48	100%	150	90	120	48	100%
43.	0	0	0	0	0%	157	95	115	57	100%	136	70	92	98	100%
44.	0	0	0	0	0%	157	68	95	56	100%	160	70	100	52	100%
45.	0	0	0	0	0%	150	100	116	59	100%	130	80	96	60	100%
46.	0	0	0	0	0%	159	72	101	59	100%	140	70	93	55	100%
47.	80	50	60	86	100%	160	98	118	60	100%	154	96	114	65	100%
48.	89	64	72	66	100%	154	90	111	55	100%	140	90	106	56	100%
49.	0	0	0	0	0%	154	100	118	55	100%	164	100	121	56	100%
50.	0	0	0	0	0%	150	90	120	60	100%	126	84	98	59	100%

INTRA OP - PERIOD

3 MINUTE						5 MINUTE					10 MINUTE				
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**
26.	140	80	100	66	100%	128	72	90	78	100%	120	80	93	79	100%
27.	148	100	116	60	100%	120	72	88	61	100%	110	72	84	62	100%
28.	140	80	100	55	100%	108	77	64	56	100%	101	72	56	55	100%
29.	121	88	74	60	100%	99	75	62	74	99%	96	71	54	40	99%
30.	140	90	66	60	100%	130	90	103	64	100%	130	80	96	65	100%
31.	125	97	108	66	100%	125	86	97	69	100%	118	75	80	70	100%
32.	140	90	106	55	100%	144	90	108	69	100%	120	70	80	60	100%
33.	140	80	100	55	100%	132	80	67	60	100%	110	80	90	62	100%
34.	150	94	112	51	100%	147	90	104	60	100%	152	94	113	62	100%
35.	140	80	100	50	100%	110	80	90	48	100%	107	68	58	89	100%
36.	153	94	113	55	100%	140	90	106	56	100%	130	90	103	59	100%
37.	140	100	113	58	100%	144	110	121	55	100%	130	90	103	62	100%
38.	140	90	103	59	100%	124	80	94	60	100%	110	70	83	70	100%
39.	144	110	121	60	100%	130	70	90	94	100%	130	90	103	70	100%
40.	140	70	86	60	100%	110	70	83	60	100%	130	70	90	65	100%
41.	140	90	106	60	100%	128	70	58	65	100%	102	70	81	71	100%
42.	130	72	101	50	100%	130	70	100	55	100%	110	72	74	56	100%
43.	148	52	84	60	100%	120	80	93	65	100%	110	70	83	70	100%
44.	140	70	93	60	100%	130	60	83	65	100%	128	62	84	70	100%
45.	130	90	103	61	100%	140	70	93	72	100%	120	70	86	74	100%
46.	150	80	96	60	100%	138	92	107	64	100%	128	70	89	64	100%
47.	149	50	83	60	100%	134	63	86	62	100%	110	70	83	75	100%
48.	132	90	104	58	100%	110	70	83	60	100%	120	72	88	64	100%
49.	140	100	113	58	100%	138	70	92	60	100%	110	76	87	61	100%
50.	150	90	120	61	100%	130	70	100	64	100%	100	60	73	65	100%

INTRA OP - PERIOD

20 MINUTE						30 MINUTE					45 MINUTE					60 MINUTE				
S.No.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	100	72	81	80	100%	120	82	94	81	100%	120	80	93	82	100%	0	0	0	0	0
27.	100	70	80	64	100%	128	70	89	70	100%	128	74	92	74	100%	0	0	0	0	0
28.	107	68	58	60	100%	132	80	67	64	100%	110	80	90	70	100%	100	7	80	72	100%
29.	107	80	67	90	100%	106	99	66	92	100%	108	80	68	90	100%	109	83	70	90	100%
30.	130	80	96	70	100%	110	80	90	75	100%	100	60	73	76	100%	100	70	80	76	100%
31.	118	77	87	72	100%	121	78	90	74	100%	116	70	85	75	100%	0	0	0	0	0
32.	120	70	80	70	100%	100	60	73	71	100%	100	60	73	69	100%	0	0	0	0	0
33.	108	77	64	70	100%	110	80	90	75	100%	130	80	96	74	100%	107	68	58	79	100%
34.	121	78	90	70	100%	118	77	87	75	100%	116	78	90	70	100%	119	80	92	72	100%
35.	108	77	64	90	100%	100	60	73	85	100%	100	60	73	88	100%	0	0	0	0	0
36.	110	70	83	60	100%	110	72	84	65	100%	100	72	81	70	100%	100	72	81	72	100%
37.	130	90	103	61	100%	112	72	85	70	100%	100	60	73	74	100%	100	62	74	74	100%
38.	110	60	76	73	100%	114	62	79	69	100%	112	80	90	73	100%	0	0	0	0	0
39.	120	70	80	75	100%	110	70	83	79	100%	110	60	76	79	100%	0	0	0	0	0
40.	116	69	84	72	100%	100	70	80	71	100%	110	80	90	78	100%	0	0	0	0	0
41.	100	60	73	72	100%	110	80	90	80	100%	100	70	80	84	100%	110	80	90	80	100%
42.	120	70	80	70	100%	110	72	83	60	100%	104	60	74	62	100%	100	70	83	69	100%
43.	114	62	79	74	100%	100	60	73	75	100%	110	70	83	76	100%	0	0	0	0	0
44.	120	72	88	72	100%	110	70	83	70	100%	100	60	73	94	100%	0	0	0	0	0
45.	110	72	84	65	100%	109	74	85	108	100%	108	70	82	75	100%	100	74	82	80	100%
46.	110	82	91	76	100%	112	84	93	72	100%	100	78	85	71	100%	0	0	0	0	0
47.	112	74	86	70	100%	116	74	87	80	100%	110	70	83	81	100%	0	0	0	0	0
48.	124	78	92	65	100%	125	72	89	67	100%	110	70	83	68	100%	0	0	0	0	0
49.	100	70	80	90	100%	102	70	80	90	100%	108	60	76	71	100%	109	60	76	74	100%
50.	104	60	74	66	100%	100	60	73	69	100%	100	62	74	70	100%	0	0	0	0	0

POST OP PERIOD

30 MINUTE							60 MINUTE					
S.No.	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
26.	120	72	88	84	100%	T8	110	74	86	85	100%	T10
27.	127	70	86	84	100%	T8	130	78	95	85	100%	T10
28.	110	80	90	80	100%	T8	112	70	86	84	100%	T10
29.	109	83	70	80	100%	T8	110	82	70	70	100%	T8
30.	110	80	90	80	100%	T10	120	70	88	84	100%	T10
31.	115	73	87	75	100%	T8	116	78	90	70	100%	T9
32.	126	70	88	78	100%	T9	120	70	80	80	100%	T10
33.	110	80	90	80	100%	T10	114	60	98	79	100%	T10
34.	110	70	83	78	100%	T8	110	60	78	72	100%	T9
35.	112	70	86	88	100%	T10	110	80	90	80	100%	T10
36.	100	70	80	80	100%	T10	118	60	79	84	100%	T10
37.	112	72	85	84	100%	T10	110	80	90	82	100%	T10
38.	110	60	76	81	100%	T10	120	70	88	82	100%	T10
39.	122	72	88	79	100%	T8	120	80	93	78	100%	T10
40.	131	62	85	79	100%	T10	124	84	97	70	100%	T11
41.	110	80	90	80	100%	T8	100	70	80	80	100%	T9
42.	110	70	83	84	100%	T10	110	80	90	81	100%	T10
43.	100	70	80	84	100%	T8	100	80	90	82	100%	T10
44.	110	72	84	84	100%	T8	122	78	92	85	100%	T8
45.	110	78	88	84	100%	T8	112	74	86	80	100%	T10
46.	110	72	81	84	100%	T8	102	72	82	85	100%	T10
47.	110	72	84	84	100%	T8	102	72	82	85	100%	T10
48.	110	60	76	84	100%	T8	104	72	82	86	100%	T10
49.	110	60	76	84	100%	T8	114	72	86	85	100%	T10
50.	120	80	93	84	100%	T10	100	62	74	80	100%	T10

POST OP PERIOD

90 MINUTE							130 MINUTE					
S.No.	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
26.	122	84	96	86	100%	T10	120	86	97	85	100%	T11
27.	119	78	91	84	100%	T10	110	70	83	80	100%	T11
28.	114	63	86	80	100%	T10	110	80	90	80	100%	T11
29.	121	88	74	70	100%	T10	110	82	70	94	100%	T10
30.	110	80	90	84	100%	T11	120	80	93	86	100%	T11
31.	113	66	77	75	100%	T10	125	77	96	75	100%	T11
32.	110	60	76	82	100%	T10	100	60	73	80	100%	T11
33.	114	63	80	80	100%	T11	110	80	90	82	100%	T11
34.	120	70	88	70	100%	T10	118	75	86	72	100%	T11
35.	110	70	83	80	100%	T11	100	60	73	79	100%	T11
36.	110	80	90	84	100%	T11	118	65	82	84	100%	T12
37.	100	70	81	84	100%	T11	100	70	81	83	100%	T11
38.	122	72	88	81	100%	T11	120	80	93	83	100%	T12
39.	126	70	88	80	100%	T11	110	60	76	81	100%	T12
40.	120	80	93	75	100%	T12	100	70	81	80	100%	T12
41.	120	70	88	82	100%	T10	114	80	91	84	100%	T11
42.	110	80	90	80	100%	T11	110	80	90	82	100%	T11
43.	118	60	79	85	100%	T11	100	60	73	80	100%	T12
44.	100	70	80	80	100%	T10	110	62	78	84	100%	T10
45.	128	70	89	84	100%	T11	120	66	80	85	100%	T11
46.	120	78	92	84	100%	T10	132	70	90	80	100%	T11
47.	109	60	76	86	100%	T10	120	74	89	85	100%	T11
48.	130	72	91	80	100%	T11	128	70	89	84	100%	T11
49.	124	78	93	80	100%	T11	118	60	79	99	100%	T11
50.	100	60	73	80	100%	T11	126	84	98	85	100%	T11

POST OP PERIOD

150 MINUTE							180 MINUTE						
S.No.	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SIDE EFFECTS**
26.	110	70	83	86	100%	T12	120	70	86	85	100%	T12	
27.	121	70	87	84	100%	T11	100	70	80	86	100%	T12	
28.	140	70	133	82	100%	T11	140	70	93	84	100%	T12	
29.	113	83	70	89	100%	T11	112	83	71	84	100%	T11	
30.	120	70	88	85	100%	T12	120	80	93	85	100%	L1	
31.	133	85	104	75	100%	T12	120	80	93	70	100%	T12	Headache
32.	110	60	76	81	100%	T11	100	60	73	84	100%	T12	Headache
33.	130	60	83	80	100%	T11	121	60	80	79	100%	T11	
34.	110	70	83	70	100%	T12	121	78	90	70	100%	T12	
35.	130	60	83	80	100%	T12	130	60	83	84	100%	T12	Headache
36.	100	70	81	80	100%	T12	120	80	93	84	100%	T12	
37.	120	80	93	80	100%	T12	120	80	93	81	100%	L1	
38.	110	70	83	80	100%	T12	100	70	83	84	100%	L1	
39.	120	70	88	71	100%	T12	120	70	88	70	100%	L1	
40.	100	70	81	81	100%	L1	130	60	83	79	100%	L1	
41.	112	72	85	80	100%	T12	120	80	93	80	100%	T12	
42.	120	80	93	83	100%	T12	120	80	93	80	100%	L1	
43.	110	70	83	79	100%	T12	100	70	80	80	100%	L1	
44.	120	78	92	82	100%	T11	110	70	83	84	100%	T12	
45.	110	60	76	84	100%	T12	120	78	92	85	100%	L1	
46.	136	70	92	84	100%	T11	124	80	95	86	100%	T12	
47.	130	70	90	84	100%	T11	115	70	85	78	100%	T12	Headache
48.	120	76	90	80	100%	T12	120	80	93	82	100%	T12	
49.	180	72	81	80	100%	T12	113	74	87	82	100%	L1	
50.	110	70	83	84	100%	T12	120	80	93	85	100%	L1	

DATA OF PATIENTS 1 - 25 (GROUP - E)

S.No	NAME	AGE	SEX	WT IN KG	HT IN CM	SENSORY LEVEL ACHIEVED				BASE LINE VALUES				
						1 MIN	3MIN	5MIN	10 MIN	SBP	DBP	MAP	HR	SPO2
1	SELVI	35	F	40	156	T10	T8	T8	T6	110	80	90	70	100%
2	SHANKAR	50	M	41	153	T10	T8	T8	T6	110	70	83	80	100%
3	BABU	29	M	45	159	T10	T8	T8	T6	110	70	83	80	100%
4	RAJENDIRAN	35	M	42	154	T10	T10	T8	T7	140	90	106	80	100%
5	HARIKRISHNAN	47	M	48	152	T8	T8	T7	T6	130	70	90	82	100%
6	VASU	50	M	45	151	T10	T8	T7	T6	100	70	83	80	100%
7	KANDEPAN	27	M	49	152	T8	T8	T7	T6	110	70	83	80	100%
8	EGAMBARAM	40	M	45	154	T10	T8	T7	T6	110	70	83	80	100%
9	MARI	40	M	52	156	T10	T8	T7	T6	110	80	90	80	100%
10	MURUGAN	50	M	49	155	T10	T8	T7	T6	110	80	90	80	100%
11	ARJUNAN	40	M	49	149	T10	T8	T7	T6	130	80	96	78	100%
12	SIVA	27	M	42	150	T8	T8	T7	T6	130	80	96	78	100%
13	MANOKAR	50	M	52	152	T10	T8	T6	T6	100	70	80	80	100%
14	KANNAN	50	M	42	158	T10	T8	T7	T6	130	70	90	90	100%
15	NAGAPPAN	47	M	49	154	T10	T8	T8	T6	100	70	80	80	100%
16	JAGATHESH	20	M	30	154	T10	T8	T7	T6	110	80	90	80	100%
17	SARANRAJ	20	M	35	159	T10	T10	T8	T7	120	70	86	80	100%
18	NAGAPPAN	50	M	50	155	T10	T8	T7	T6	130	80	96	84	100%
19	VIJAYAN	35	M	49	158	T10	T8	T7	T6	100	70	80	80	100%
20	SHANMUGAM	50	M	45	152	T10	T8	T8	T6	130	60	83	84	100%
21	MEGABABASHIA	40	M	48	156	T10	T10	T8	T6	110	70	83	80	100%
22	SUKUMAR	47	M	52	155	T10	T8	T7	T6	130	80	96	80	100%
23	ARUMUGAM	35	M	40	154	T8	T8	T7	T7	110	70	83	80	100%
24	ASAITHAMBI	50	M	57	149	T11	T10	T7	T6	130	80	96	84	100%
25	ARUMUGAM	45	M	52	148	T10	T8	T7	T6	110	70	83	80	100%

INTRA OP PERIOD

1 MINUTE						2 MINUTE					3 MINUTE				
S.NO	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**
1.	110	84	92	80	100%	100	70	80	82	100%	80	42	54	81	100%
2.	110	74	86	84	100%	98	70	79	85	100%	80	40	53	79	100%
3.	132	72	92	78	100%	104	72	82	79	100%	90	60	70	80	100%
4.	120	70	86	84	100%	90	60	70	80	100%	0	0	0	0	0
5.	130	90	103	80	100%	100	72	81	80	100%	90	50	63	84	100%
6.	110	64	79	80	100%	102	60	74	84	100%	120	79	92	80	100%
7.	128	70	89	80	100%	100	62	74	80	100%	90	64	72	84	100%
8.	111	72	85	84	100%	101	68	79	80	100%	82	54	63	82	100%
9.	100	60	73	72	100%	102	70	80	80	100%	80	50	60	84	100%
10.	110	74	86	84	100%	100	60	73	85	100%	80	54	62	80	100%
11.	110	70	80	82	100%	80	50	60	84	100%	0	0	0	0	0
12.	130	80	96	80	100%	127	79	93	85	100%	102	44	61	82	100%
13.	132	70	90	78	100%	110	78	88	78	100%	90	52	64	79	100%
14.	130	80	96	84	100%	126	78	94	80	100%	100	60	73	84	100%
15.	110	72	84	80	100%	108	60	76	81	100%	80	56	64	84	100%
16.	120	82	94	86	100%	109	79	89	84	100%	90	62	71	80	100%
17.	120	60	80	84	100%	90	45	60	80	100%	0	0	0	0	0
18.	130	70	90	80	100%	117	60	79	84	100%	90	50	63	85	100%
19.	110	60	76	80	100%	100	70	80	84	100%	70	50	56	80	100%
20.	130	70	90	80	100%	121	72	88	84	100%	110	60	76	88	100%
21.	124	70	58	80	100%	100	60	73	82	100%	101	72	81	84	100%
22.	130	90	103	80	100%	100	70	80	84	100%	90	56	67	80	100%
23.	110	70	83	82	100%	100	58	72	84	100%	80	48	58	80	100%
24.	110	70	80	84	100%	110	70	80	82	100%	106	70	79	80	100%
25.	150	100	118	82	100%	120	80	93	84	100%	90	60	70	80	100%

INTRA OP PERIOD

5 MINUTE						1 MINUTE					2 MINUTE				
S.NO	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
1.	0	0	0	0	0%	124	74	90	82	100%	110	74	86	80	100%
2.	0	0	0	0	0%	121	74	89	88	100%	120	60	80	86	100%
3.	0	0	0	0	0%	121	74	89	84	100%	124	70	88	80	100%
4.	0	0	0	0	0%	118	72	87	85	100%	122	72	88	85	100%
5.	0	0	0	0	0%	110	60	76	85	100%	112	72	85	92	100%
6.	80	49	59	82	100%	128	70	89	89	100%	120	61	80	98	100%
7.	0	0	0	0	0%	110	74	86	80	100%	100	70	80	78	100%
8.	0	0	0	0	0%	120	72	88	80	100%	110	74	86	89	100%
9.	0	0	0	0	0%	110	70	84	85	100%	106	72	83	86	100%
10.	0	0	0	0	0%	120	82	94	80	100%	104	72	82	89	100%
11.	0	0	0	0	0%	108	74	85	85	100%	111	72	85	78	100%
12.	87	38	51	85	100%	103	43	60	90	100%	109	73	85	84	100%
13.	0	0	0	0	0%	110	72	84	80	100%	108	92	97	85	100%
14.	90	50	63	80	100%	110	76	87	89	100%	108	78	88	90	100%
15.	0	0	0	0	0%	100	72	81	80	100%	100	68	78	89	100%
16.	0	0	0	0	0%	110	74	86	84	100%	120	84	96	89	100%
17.	0	0	0	0	0%	120	82	94	85	100%	121	60	80	80	100%
18.	0	0	0	0	0%	120	70	86	80	100%	128	78	94	80	100%
19.	0	0	0	0	0%	110	80	90	85	100%	120	70	86	86	100%
20.	90	60	70	80	100%	132	78	96	90	100%	128	74	92	92	100%
21.	90	60	70	85	100%	110	70	83	89	100%	120	80	93	88	100%
22.	0	0	0	0	0%	130	90	103	80	100%	140	70	93	90	100%
23.	0	0	0	0	0%	121	60	80	88	100%	110	70	83	89	100%
24.	84	60	68	87	100%	100	70	80	86	100%	104	70	81	87	100%
25.	0	0	0	0	0%	110	72	84	89	100%	110	70	83	86	100%

INTRA OP PERIOD

3 MINUTE						5 MINUTE					10 MINUTE				
S.NO	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**
1.	118	74	88	85	100%	106	70	82	80	100%	117	64	81	80	100%
2.	120	73	87	80	100%	119	68	87	80	100%	121	70	87	85	100%
3.	128	74	92	85	100%	120	60	80	83	100%	118	72	87	80	100%
4.	110	74	86	89	100%	102	75	84	79	100%	120	70	83	78	100%
5.	116	62	80	94	100%	110	74	92	88	100%	118	60	79	87	100%
6.	116	80	92	88	100%	118	72	87	87	100%	110	80	90	80	100%
7.	128	74	82	81	100%	120	60	80	80	100%	120	90	100	88	100%
8.	112	70	84	87	100%	118	69	85	80	100%	121	74	89	80	100%
9.	116	78	90	80	100%	109	60	76	88	100%	112	72	85	89	100%
10.	106	74	84	90	100%	108	70	82	88	100%	112	74	86	87	100%
11.	109	70	83	78	100%	125	76	90	85	100%	127	79	93	90	100%
12.	117	79	91	86	100%	129	79	93	87	100%	122	78	94	88	100%
13.	16	78	90	80	100%	113	68	83	80	100%	120	72	88	84	100%
14.	109	74	85	91	100%	112	74	86	94	100%	120	82	94	80	100%
15.	106	52	70	90	100%	100	60	73	87	100%	124	80	94	88	100%
16.	121	80	93	88	100%	128	72	90	87	100%	120	60	80	88	100%
17.	128	70	89	81	100%	110	72	84	78	100%	106	70	82	78	100%
18.	110	60	76	88	100%	117	72	87	89	100%	110	60	76	92	100%
19.	118	72	87	80	100%	117	72	87	80	100%	117	60	79	85	100%
20.	110	60	76	88	100%	120	74	89	74	100%	124	88	100	75	100%
21.	110	70	83	88	100%	120	84	96	87	100%	110	80	90	80	100%
22.	120	74	89	78	100%	128	70	89	85	100%	120	74	89	80	100%
23.	108	74	85	85	100%	100	60	73	86	100%	120	74	89	81	100%
24.	104	68	80	82	100%	100	68	79	88	100%	100	70	80	92	100%
25.	110	70	83	84	100%	100	70	80	75	100%	108	71	83	79	100%

INTRA OP PERIOD

20 MINUTE						30 MINUTE					45 MINUTE					60 MINUTE				
S.NO.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
1.	118	70	86	80	100%	107	68	81	82	100%	118	60	76	80	100%	0	0	0	0	0
2.	110	82	91	84	100%	128	88	94	83	100%	123	60	80	80	100%	0	0	0	0	0
3.	119	70	89	84	100%	120	70	80	84	100%	121	60	80	85	100%	0	0	0	0	0
4.	108	72	84	74	100%	109	60	76	78	100%	100	70	80	75	100%	0	0	0	0	0
5.	120	74	89	87	100%	120	70	86	79	100%	110	70	83	78	100%	0	0	0	0	0
6.	110	60	76	88	100%	112	72	85	80	100%	110	81	90	81	100%	0	0	0	0	0
7.	111	81	91	80	100%	106	84	91	80	100%	109	87	94	80	100%	0	0	0	0	0
8.	120	70	83	85	100%	119	64	79	82	100%	124	82	96	81	100%	120	83	92	80	100%
9.	104	75	84	90	100%	120	60	80	88	100%	120	70	86	81	100%	0	0	0	0	0
10.	114	70	84	86	100%	118	72	87	80	100%	120	68	85	85	100%	0	0	0	0	0
11.	121	75	89	83	100%	116	73	85	84	100%	106	70	82	85	100%	108	74	85	80	100%
12.	110	60	76	79	100%	116	73	85	78	100%	118	74	87	75	100%	110	66	76	76	100%
13.	118	79	92	85	100%	110	62	78	80	100%	110	70	83	80	100%	0	0	0	0	0
14.	100	70	80	82	100%	100	74	82	78	100%	110	78	88	79	100%	110	80	90	76	100%
15.	100	70	80	89	100%	107	70	80	72	100%	104	84	90	74	100%	100	70	80	78	100%
16.	110	70	83	89	100%	100	60	73	80	100%	110	80	90	81	100%	110	72	84	82	100%
17.	108	74	85	85	100%	100	60	73	85	100%	110	70	83	80	100%	0	0	0	0	0
18.	122	70	87	87	100%	120	70	86	80	100%	100	78	85	85	100%	110	60	76	80	100%
19.	110	70	83	80	100%	118	72	87	84	100%	119	70	86	80	100%	0	0	0	0	0
20.	114	68	83	80	100%	118	70	86	85	100%	120	68	85	82	100%	0	0	0	0	0
21.	121	70	87	85	100%	100	60	73	84	100%	110	82	84	82	100%	0	0	0	0	0
22.	110	70	83	84	100%	108	72	84	89	100%	100	80	86	85	100%	120	74	89	88	100%
23.	120	82	94	78	100%	109	70	83	80	100%	110	74	86	85	100%	0	0	0	0	0
24.	100	70	80	85	100%	100	70	80	85	100%	100	70	80	82	100%	0	0	0	0	0
25.	106	70	83	80	100%	107	86	96	81	100%	103	70	81	84	100%	106	70	83	80	100%

POST OP PERIOD

30 MINUTE							60 MINUTE					
S.NO.	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
1.	110	74	86	84	100%	T8	110	78	88	82	100%	T10
2.	120	78	92	80	100%	T8	112	64	78	80	100%	T10
3.	121	68	85	80	100%	T8	132	70	90	84	100%	T10
4.	114	64	80	80	100%	T8	120	74	89	80	100%	T10
5.	124	74	90	80	100%	T8	134	70	91	84	100%	T9
6.	124	70	84	80	100%	T8	120	60	80	84	100%	T10
7.	110	74	86	84	100%	T8	116	82	93	80	100%	T10
8.	110	72	84	84	100%	T8	116	70	85	85	100%	T10
9.	120	71	87	84	100%	T8	130	70	90	80	100%	T8
10.	124	70	88	80	100%	T8	114	64	80	84	100%	T10
11.	110	70	83	76	100%	T8	121	74	90	79	100%	T10
12.	120	74	89	80	100%	T8	125	76	90	82	100%	T8
13.	104	82	89	84	100%	T10	102	70	80	80	100%	T10
14.	112	78	89	84	100%	T8	113	70	84	80	100%	T10
15.	121	78	92	80	100%	T8	110	70	83	80	100%	T10
16.	120	84	96	84	100%	T10	121	78	92	80	100%	T10
17.	130	60	83	84	100%	T7	112	74	86	80	100%	T8
18.	110	70	83	80	100%	T8	121	70	87	84	100%	T9
19.	110	70	83	84	100%	T8	110	80	90	80	100%	T10
20.	122	76	91	80	100%	T8	110	60	76	84	100%	T10
21.	114	70	84	80	100%	T10	118	74	88	80	100%	T11
22.	110	80	90	84	100%	T8	124	78	93	85	100%	T9
23.	110	80	90	84	100%	T8	120	70	86	80	100%	T10
24.	110	70	80	82	100%	T8	100	68	79	84	100%	T8
25.	100	70	81	82	100%	T10	120	84	96	83	100%	T10

POST OP PERIOD

90 MINUTE							130 MINUTE					
S.NO	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
1.	120	70	86	80	100%	T10	119	72	87	81	100%	T11
2.	114	70	84	84	100%	T10	118	72	87	80	100%	T11
3.	128	70	89	80	100%	T11	132	70	90	81	100%	T11
4.	124	75	91	80	100%	T10	122	70	87	84	100%	T11
5.	131	74	93	80	100%	T10	128	60	82	88	100%	T11
6.	128	72	90	80	100%	T10	110	60	76	84	100%	T11
7.	118	70	86	82	100%	T10	114	72	86	80	100%	T11
8.	118	60	79	80	100%	T10	111	60	77	84	100%	T11
9.	110	60	76	84	100%	T10	112	70	84	80	100%	T10
10.	118	78	91	80	100%	T10	109	60	76	84	100%	T11
11.	110	60	73	80	100%	T10	120	80	93	81	100%	T11
12.	121	72	86	84	100%	T10	110	70	83	85	100%	T10
13.	110	64	79	85	100%	T11	104	70	81	80	100%	T11
14.	121	70	87	84	100%	T10	110	72	84	80	100%	T11
15.	111	74	86	84	100%	T10	109	80	92	85	100%	T11
16.	110	82	84	84	100%	T11	112	78	89	80	100%	T11
17.	114	80	91	84	100%	T10	121	84	96	85	100%	T10
18.	110	78	88	80	100%	T10	110	60	76	84	100%	T10
19.	112	70	84	80	100%	T10	110	74	86	85	100%	T11
20.	112	72	85	80	100%	T10	114	74	87	80	100%	T11
21.	120	80	93	84	100%	T11	110	60	76	80	100%	T12
22.	126	70	88	80	100%	T10	120	78	92	80	100%	T11
23.	110	60	76	84	100%	T10	112	78	89	80	100%	T11
24.	106	70	79	80	100%	T10	106	70	79	80	100%	T10
25.	100	70	82	83	100%	T11	122	84	96	79	100%	T11

POST OP PERIOD

150 MINUTE							180 MINUTE						
S.NO	SBP	DBP	MAP	HR	SPO2	SENSORY LEVEL	SBP	DBP	MAP	HR	SPO2	SENSORY LEVEL	SIDE EFFECTS
1.	114	70	84	80	100%	T11	118	74	88	84	100%	T12	0
2.	110	62	78	84	100%	T11	112	60	77	80	100%	T12	0
3.	128	62	84	80	100%	T12	125	70	88	85	100%	LI	0
4.	124	70	88	80	100%	T11	126	74	91	85	100%	T12	0
5.	120	70	86	80	100%	T11	110	72	84	84	100%	T12	0
6.	112	72	85	80	100%	T12	110	82	91	80	100%	L1	0
7.	121	60	80	84	100%	T11	120	84	96	80	100%	T12	0
8.	119	82	94	80	100%	T11	110	74	86	83	100%	T12	0
9.	108	72	84	80	100%	T11	100	72	81	80	100%	T11	0
10.	110	62	78	85	100%	T11	112	70	84	80	100%	T12	0
11.	110	68	84	79	100%	T11	110	70	83	70	100%	T12	0
12.	102	58	76	87	100%	T11	114	63	86	88	100%	T12	0
13.	113	64	80	82	100%	T12	112	70	84	80	100%	T12	0
14.	119	70	86	80	100%	T11	120	60	80	84	100%	T12	0
15.	108	70	82	80	100%	T11	116	78	79	80	100%	T12	0
16.	114	70	84	84	100%	T12	118	74	88	80	100%	L1	0
17.	116	86	96	80	100%	T11	121	74	89	80	100%	T11	0
18.	122	88	99	84	100%	T11	130	70	90	80	100%	T12	0
19.	100	60	73	80	100%	T11	110	70	83	78	100%	T12	0
20.	120	70	86	80	100%	T11	128	90	102	84	100%	T12	0
21.	120	70	86	84	100%	T12	121	70	87	80	100%	L1	0
22.	128	74	92	82	100%	T12	120	60	80	85	100%	T12	0
23.	110	60	76	84	100%	T12	120	72	88	85	100%	T12	0
24.	110	70	80	82	100%	T12	110	70	80	84	100%	T12	0
25.	100	70	81	80	100%	T12	124	84	97	82	100%	T12	0

DATA OF PATIENTS 26 - 50 (GROUP - E)

S.No	NAME	AGE	SEX	WT IN KG	HT IN CM	SENSORY LEVEL ACHIEVED				BASE LINE VALUES				
						1 MIN	3MIN	5MIN	10 MIN	SBP	DBP	MAP	HR	SPO2
26	BOOPATHY	50	M	52	154	T10	T8	T7	T6	110	70	83	80	100%
27	ANBAZAGI	25	F	45	148	T10	T10	T8	T6	110	70	83	80	100%
28	MANIKANDAN	20	M	54	155	T10	T8	T8	T7	110	70	83	80	100%
29	MOHAN	25	M	52	159	T10	T8	T7	T7	120	80	93	80	100%
30	DURAIRAJ	48	M	45	155	T8	T8	T7	T6	110	80	90	80	100%
31	KESAVAN	34	M	45	153	T10	T8	T7	T6	110	70	83	80	100%
32	ADIMULAM	45	M	49	156	T10	T8	T7	T6	110	70	83	80	100%
33	DEVAN	32	M	40	154	T8	T7	T6	T6	120	70	83	80	100%
34	ELUMALAI	45	M	52	153	T10	T10	T8	T7	110	60	76	70	100%
35	MUNUSAMY	40	M	40	154	T10	T8	T7	T6	110	60	76	88	100%
36	VIJAYAKUMARI	40	F	39	159	T10	T10	T8	T7	110	70	83	80	100%
37	PERUMAL	42	M	63	158	T10	T8	T7	T7	160	100	90	80	100%
38	IYYAPPAN	24	M	45	158	T10	T10	T8	T7	110	70	83	84	100%
39	VIJAYAKUMAR	20	M	40	149	T10	T7	T6	T6	110	70	83	80	100%
40	GOVINDASAMY	42	M	78	156	T10	T8	T7	T6	110	70	83	80	100%
41	NEELAMEGAM	32	M	50	156	T10	T8	T7	T6	110	70	83	80	100%
42	VANITHA	35	F	40	148	T10	T8	T7	T6	110	70	83	80	100%
43	GOVINDAN	40	M	45	156	T10	T8	T7	T6	130	90	103	80	100%
44	MALAR	35	F	48	147	T12	T10	T6	T6	140	90	106	80	100%
45	ELUMALAI	50	M	51	157	T10	T9	T8	T6	140	90	106	80	100%
46	KUPPAN	50	M	43	152	T8	T8	T7	T6	110	80	90	74	100%
47	GOVINDAN	40	M	39	154	T10	T8	T7	T6	110	80	90	80	100%
48	PERIYANDAVAR	35	M	52	156	T12	T11	T10	T6	140	70	93	80	100%
49	MANIVANAN	40	M	50	154	S	T8	T7	T6	110	70	83	84	100%
50	DEVADAS	45	M	42	151	T10	T8	T7	T6	120	70	86	80	100%

INTRA OP - PERIOD

1 MINUTE						2 MINUTE					3 MINUTE				
S.No	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	110	70	83	84	100%	100	60	73	80	100%	83	58	43	86	100%
27.	114	84	94	70	100%	107	86	96	85	100%	108	71	86	80	100%
28.	110	70	83	82	100%	100	82	52	80	100%	76	53	60	60	100%
29.	131	62	85	78	100%	120	90	100	84	100%	118	60	81	80	100%
30.	106	71	83	85	100%	108	71	86	70	100%	106	71	83	81	100%
31.	120	82	94	80	100%	100	62	74	84	100%	90	58	68	80	100%
32.	121	72	88	84	100%	101	70	80	85	100%	90	48	62	70	100%
33.	120	80	93	84	100%	110	60	66	85	100%	90	50	63	80	100%
34.	110	60	76	84	100%	104	58	76	85	100%	101	60	73	80	100%
35.	120	90	100	78	100%	120	70	86	79	100%	120	70	86	84	100%
36.	130	80	96	84	100%	132	50	78	80	100%	110	70	80	82	100%
37.	160	100	120	84	100%	150	100	118	80	100%	100	50	66	95	100%
38.	110	70	83	82	100%	76	53	60	80	100%	0	0	0	0	0
39.	110	70	83	90	100%	100	60	73	80	100%	83	58	43	100	100%
40.	140	90	108	91	100%	130	90	103	90	100%	90	72	78	84	100%
41.	110	80	90	100	100%	100	70	80	98	100%	80	60	66	100	100%
42.	120	70	86	80	100%	106	60	75	84	100%	90	50	63	80	100%
43.	130	100	110	84	100%	121	70	87	80	100%	110	60	78	80	100%
44.	130	90	103	82	100%	90	63	72	84	100%	0	0	0	0	0
45.	140	100	113	89	100%	137	98	111	80	100%	110	70	80	82	100%
46.	130	90	103	80	100%	90	72	78	88	100%	0	0	0	0	0
47.	106	76	86	80	100%	101	60	73	80	100%	70	50	56	84	100%
48.	153	98	117	89	100%	150	93	114	90	100%	133	85	85	104	100%
49.	110	60	76	80	100%	101	74	83	87	100%	102	78	86	78	100%
50.	121	77	91	80	100%	100	60	73	84	100%	90	55	66	82	100%

INTRA OP - PERIOD

5 MINUTE						1 MINUTE					2 MINUTE				
S.No	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	0	0	0	0	0%	108	85	71	90	100%	104	76	61	82	100%
27.	106	71	83	76	100%	122	72	85	68	100%	130	78	94	69	100%
28.	0	0	0	0	0%	87	66	55	54	100%	87	66	55	60	100%
29.	90	60	70	79	100%	104	68	80	92	100%	116	55	83	80	100%
30.	80	50	60	84	100%	122	72	85	80	100%	130	78	94	81	100%
31.	0	0	0	0	0%	130	70	90	82	100%	121	68	75	82	100%
32.	0	0	0	0	0%	110	74	86	85	100%	104	72	82	80	100%
33.	0	0	0	0	0%	104	72	82	80	100%	105	62	76	84	100%
34.	80	50	60	70	100%	112	60	77	75	100%	117	72	87	88	100%
35.	90	60	70	80	100%	116	55	83	86	100%	120	70	86	87	100%
36.	80	50	60	81	100%	110	60	70	85	100%	110	62	78	98	100%
37.	0	0	0	0	0%	110	70	83	100	100%	110	72	84	90	100%
38.	0	0	0	0	0%	100	72	52	85	100%	87	66	55	83	100%
39.	0	0	0	0	0%	108	85	71	112	100%	108	85	71	100	100%
40.	0	0	0	0	0%	106	70	82	80	100%	125	80	75	80	100%
41.	0	0	0	0	0%	110	80	90	86	100%	110	70	83	80	100%
42.	0	0	0	0	0%	110	70	83	85	100%	104	70	81	86	100%
43.	90	58	68	89	100%	100	60	73	78	100%	128	70	89	79	100%
44.	0	0	0	0	0%	99	60	72	82	100%	115	73	87	80	100%
45.	80	50	60	100	100%	110	60	76	104	100%	110	62	78	98	100%
46.	0	0	0	0	0%	125	80	75	82	100%	125	77	96	84	100%
47.	0	0	0	0	0%	110	72	84	85	100%	112	60	77	90	100%
48.	125	77	96	78	100%	102	58	75	81	100%	100	58	76	80	100%
49.	80	58	65	77	100%	110	82	91	74	100%	104	78	86	85	100%
50.	0	0	0	0	0%	110	60	76	80	100%	112	72	85	80	100%

INTRA OP - PERIOD

3 MINUTE						5 MINUTE					10 MINUTE				
S.No	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	110	70	83	84	100%	112	70	84	70	100%	100	62	74	74	100%
27.	143	77	105	72	100%	126	74	94	70	100%	112	74	86	71	100%
28.	104	78	86	61	100%	101	72	59	73	100%	110	60	70	74	100%
29.	118	60	81	82	100%	120	70	86	72	100%	118	60	81	74	100%
30.	112	74	86	83	100%	143	77	105	85	100%	108	71	83	86	100%
31.	120	78	92	80	100%	112	74	86	85	100%	110	70	83	86	100%
32.	102	70	80	92	100%	121	74	89	89	100%	118	68	84	70	100%
33.	118	70	86	86	100%	120	70	86	89	100%	110	72	84	90	100%
34.	119	60	79	89	100%	120	71	87	90	100%	118	72	87	89	100%
35.	118	60	81	70	100%	122	72	85	75	100%	108	71	83	78	100%
36.	108	74	85	90	100%	110	70	80	96	100%	109	70	83	84	100%
37.	110	70	83	94	100%	110	70	83	90	100%	110	60	76	84	100%
38.	101	72	59	90	100%	100	70	80	85	100%	104	78	86	86	100%
39.	104	76	61	112	100%	110	70	83	80	100%	104	76	61	85	100%
40.	125	80	75	82	100%	112	70	66	99	100%	110	60	78	80	100%
41.	100	60	73	84	100%	100	60	73	85	100%	106	60	75	87	100%
42.	120	72	84	84	100%	118	60	79	78	100%	119	70	86	79	100%
43.	110	60	76	79	100%	121	74	89	80	100%	125	78	93	84	100%
44.	103	66	78	80	100%	107	66	84	85	100%	104	65	76	78	100%
45.	109	70	83	90	100%	110	64	79	85	100%	111	72	85	86	100%
46.	114	63	86	80	100%	117	81	93	86	100%	122	85	70	87	100%
47.	120	74	92	86	100%	119	74	92	81	100%	121	80	93	88	100%
48.	114	63	86	92	100%	112	70	86	90	100%	114	63	86	91	100%
49.	110	80	90	80	100%	112	74	86	80	100%	114	70	84	83	100%
50.	120	80	93	90	100%	110	72	84	89	100%	108	70	82	88	100%

INTRA OP - PERIOD

20 MINUTE						30 MINUTE					45 MINUTE					60 MINUTE				
S.No.	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2	SBP	DBP	MAP	HR	SPO2
26.	106	73	52	88	100%	100	60	73	78	100%	110	70	83	75	100%	112	70	84	80	100%
27.	103	72	83	70	100%	106	70	83	66	100%	108	79	67	60	100%	106	70	83	70	100%
28.	101	72	59	73	100%	99	70	58	70	100%	100	70	80	72	100%	0	0	0	0	0
29.	99	48	65	80	100%	110	70	83	84	100%	100	70	80	80	100%	0	0	0	0	0
30.	108	79	67	89	100%	103	72	83	75	100%	106	70	83	70	100%	106	70	83	74	100%
31.	114	74	87	84	100%	118	72	87	85	100%	116	84	94	80	100%	0	0	0	0	0
32.	130	70	90	81	100%	110	70	83	84	100%	110	60	76	85	100%	0	0	0	0	0
33.	110	60	76	91	100%	110	72	84	92	100%	108	70	82	84	100%	110	72	84	88	100%
34.	120	84	96	88	100%	120	70	86	80	100%	120	72	88	87	100%	0	0	0	0	0
35.	106	71	83	82	100%	112	74	86	88	100%	108	71	86	86	100%	0	0	0	0	0
36.	106	70	82	85	100%	111	72	85	80	100%	111	72	85	82	100%	0	0	0	0	0
37.	99	48	65	80	100%	110	70	83	84	100%	100	70	80	80	100%	110	70	83	80	100%
38.	110	60	70	78	100%	99	70	58	79	100%	110	60	70	76	100%	101	72	59	80	100%
39.	95	65	51	88	100%	108	85	71	100	100%	106	73	52	96	100%	100	60	73	94	100%
40.	114	79	66	83	100%	117	81	93	80	100%	116	81	69	80	100%	122	85	70	70	100%
41.	106	60	75	88	100%	106	70	82	90	100%	104	70	81	83	100%	0	0	0	0	0
42.	110	70	83	70	100%	116	74	88	78	100%	110	74	86	79	100%	0	0	0	0	0
43.	126	70	88	85	100%	120	72	88	80	100%	120	60	46	81	100%	0	0	0	0	0
44.	111	62	74	77	100%	113	66	77	75	100%	110	68	84	77	100%	110	66	80	78	100%
45.	108	74	85	80	100%	110	70	83	84	100%	106	70	82	84	100%	0	0	0	0	0
46.	110	66	80	84	100%	110	68	84	80	100%	116	81	69	85	100%	110	70	83	80	100%
47.	120	83	98	81	100%	124	80	94	85	100%	110	60	76	80	100%	121	72	88	80	100%
48.	110	68	84	90	100%	110	66	80	90	100%	0	0	0	0	0	0	0	0	0	0
49.	120	80	93	84	100%	121	82	88	80	100%	110	60	76	85	100%	100	72	81	80	100%
50.	107	80	89	70	100%	110	70	83	74	100%	119	72	87	75	100%	0	0	0	0	0

POST OP PERIOD

30 MINUTE							60 MINUTE					
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
26.	113	83	70	80	100%	T8	109	83	70	82	100%	T10
27.	106	79	66	84	100%	T10	121	88	74	82	100%	T10
28.	100	72	52	74	100%	T10	99	70	52	78	100%	T11
29.	100	70	81	84	100%	T10	100	70	81	83	100%	T10
30.	113	83	70	82	100%	T8	121	88	74	82	100%	T10
31.	120	72	88	84	100%	T8	121	60	80	80	100%	T10
32.	120	80	93	84	100%	T8	110	60	76	85	100%	T8
33.	116	74	88	84	100%	T9	118	70	86	85	100%	T10
34.	110	62	78	80	100%	T8	112	70	84	84	100%	T9
35.	100	72	52	80	100%	T8	122	84	96	80	100%	T10
36.	110	70	80	70	100%	T10	134	94	107	74	100%	T10
37.	100	70	80	84	100%	T10	100	70	80	83	100%	T10
38.	110	80	90	82	100%	T10	110	60	70	84	100%	T10
39.	100	62	74	84	100%	T7	112	70	84	83	100%	T10
40.	100	70	81	84	100%	T10	110	80	90	82	100%	T10
41.	110	60	70	80	100%	T8	120	70	88	83	100%	T9
42.	112	84	93	82	100%	T8	114	70	84	80	100%	T10
43.	120	70	86	84	100%	T8	110	60	76	80	100%	T10
44.	121	74	90	80	100%	T8	128	83	101	80	100%	T8
45.	110	70	80	70	100%	T8	130	90	103	75	100%	T9
46.	110	70	83	84	100%	T8	121	74	90	82	100%	T10
47.	121	80	93	84	100%	T8	110	80	90	84	100%	T10
48.	128	83	101	80	100%	T8	130	90	103	84	100%	T10
49.	110	82	91	84	100%	T10	100	70	80	80	100%	T10
50.	110	80	90	84	100%	T8	118	70	86	80	100%	T9

POST OP PERIOD

90 MINUTE							130 MINUTE					
S.No	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**	**SBP**	**DBP**	**MAP**	**HR**	**SPO2**	**SENSORY LEVEL**
26.	121	88	74	84	100%	T10	110	82	70	80	100%	T11
27.	110	82	70	80	100%	T11	109	83	70	82	100%	T12
28.	110	60	70	70	100%	T11	112	72	64	82	100%	T12
29.	120	84	96	84	100%	T11	122	84	96	86	100%	T12
30.	109	83	70	84	100%	T10	113	83	70	82	100%	T11
31.	110	60	76	82	100%	T10	120	74	89	80	100%	T11
32.	113	74	87	80	100%	T10	111	70	83	80	100%	T10
33.	107	74	85	80	100%	T11	114	78	90	82	100%	T12
34.	114	74	87	80	100%	T10	120	74	89	85	100%	T10
35.	110	60	70	79	100%	T10	110	80	90	78	100%	T11
36.	130	98	108	74	100%	T11	120	80	93	79	100%	T11
37.	120	84	96	84	100%	T11	122	84	96	86	100%	T11
38.	112	72	64	85	100%	T11	100	70	80	80	100%	T11
39.	110	60	78	84	100%	T10	110	70	83	82	100%	T12
40.	110	80	90	84	100%	T11	110	80	90	83	100%	T11
41.	120	70	88	84	100%	T9	100	70	80	85	100%	T10
42.	118	60	79	84	100%	T11	100	60	73	80	100%	T11
43.	118	72	87	84	100%	T10	120	60	80	80	100%	T11
44.	130	90	103	82	100%	T10	130	92	104	84	100%	T10
45.	134	94	107	72	100%	T10	140	90	106	70	100%	T11
46.	128	83	101	80	100%	T10	130	92	104	80	100%	T11
47.	124	85	98	80	100%	T11	110	60	76	84	100%	T11
48.	121	74	90	80	100%	T10	130	92	104	84	100%	T11
49.	100	60	73	84	100%	T11	110	72	84	80	100%	T11
50.	110	80	90	80	100%	T10	120	70	86	84	100%	T11

POST OP PERIOD

150 MINUTE							180 MINUTE						
S.No	SBP	DBP	MAP	HR	SPO2	SENSORY LEVEL	SBP	DBP	MAP	HR	SPO2	SENSORY LEVEL	SIDE EFFECTS
26.	126	79	94	85	100%	T11	110	70	83	80	100%	T12	0
27.	113	83	70	82	100%	T12	113	83	70	84	100%	L1	0
28.	112	60	72	80	100%	T12	110	80	90	84	100%	L1	0
29.	122	80	94	82	100%	T12	124	84	97	82	100%	L1	0
30.	106	79	66	84	100%	T11	120	80	93	85	100%	T12	0
31.	124	70	88	84	100%	T11	120	81	94	86	100%	T12	0
32.	124	84	97	80	100%	T11	110	62	78	84	100%	T12	0
33.	121	76	91	80	100%	T12	106	84	91	84	100%	L1	0
34.	121	72	88	80	100%	T11	110	70	83	80	100%	T12	0
35.	124	84	97	74	100%	T11	100	70	81	80	100%	T12	0
36.	121	88	74	78	100%	T12	130	90	103	70	100%	L1	0
37.	122	80	94	80	100%	T12	124	84	97	82	100%	T12	0
38.	102	80	94	85	100%	T12	124	84	97	80	100%	T12	0
39.	112	72	80	80	100%	L1	112	72	80	80	100%	L1	0
40.	120	80	93	84	100%	T12	120	80	93	84	100%	L1	0
41.	110	70	83	80	100%	T10	110	70	83	80	100%	T11	0
42.	110	70	83	84	100%	T12	120	70	86	80	100%	L1	0
43.	110	70	83	80	100%	T11	120	72	88	84	100%	T12	0
44.	132	92	105	82	100%	T12	132	92	105	84	100%	T12	0
45.	140	90	106	74	100%	T11	130	98	108	70	100%	T12	0
46.	121	74	90	82	100%	T11	128	83	103	80	100%	T12	0
47.	108	72	84	80	100%	T12	110	62	78	84	100%	T12	0
48.	130	90	103	84	100%	T11	130	90	103	84	100%	T12	0
49.	108	60	76	80	100%	T12	110	72	84	80	100%	L1	0
50.	118	70	86	80	100%	T11	120	60	90	84	100%	T12	0